RAILROAD GAZETTE

SATURDAY, AUGUST 31, 1872.

Contributions.

PRACTICAL FIELD ENGINEERING.

NUMBER III.

SETTING OUT TRESTLES ON CURVES.

The following is the best practical method of setting out the ground line of trestle bents where the trestle is on a curve:

Say your bents are to be 12½ feet apart. Run in your curve by either of the methods already explained, and, beginning at a point in your curve 6¼ feet from the point in which you wish to erect the first bent, establish a number of chords equal to the number of bents contained in your trestle, each chord intercepting an arc of your circle 12½ feet long. At the middle point of each of these chords set out a line at right angles with the chord. The point where this last line cuts your curve is the middle of the base of your bent, which base must follow the direction of the line. That is, each bent will be in the direction of a radius of the curve, as it should be.

The above method will also apply to setting out culverts, cattle guards, pass-ways, etc., when they are on a curve.

COMPOUND AND REVERSE CURVES.

Compound curves may be located by the following very simple method: Say you have a curve to locate through an angle of 20 degrees, and beginning at the proper P. C. you have located a 1-deg. curve for a distance of ten stations. This, of course, exhausts just one-half of your angle. Now if you desire to compound your curve with a 2-deg. curve at this point, you have only to set your transit accurately over the last station of your 1-deg. curve and turn into tangent, which makes you ready to begin your deflections for the new curve, which, of course, will in this case run through ten degrees, or five stations, terminating at the proper P. T.

In a reverse curve, the P. T. of your first curve is the P. C. of your second one; and you have only to begin at this point, after having run in your first curve, and trace the second curve in a direction reverse to that of the first, terminating at the proper P. T.

Trestle bents are located and set out on compound and reverse curves, just as in the case of simple curves.

Note 1. To find the degree of curvature, divide 5,730 by the radius in feet.

Note 2. To find the length of your curve, divide your angle of deflection by the degree of curvature: result will be the length in feet.

Note 3. To find the middle ordinate to any chord for any degree of curvature: From the square of the radius substract the square of half your chord, extract the square root of remainder, and substract this root from radius: result will be the middle ordinate.

A second method for finding the middle ordinate is to subtract the natural cosine of half the degree of curvature from 1 and multiply remainder by radius of curvature.

But the simplest rule is to multiply the ordinates of a 1-deg. curve by the deflection angle of the curve whose ordinates are required. This is general and applies to *any ordinate;* but in order to use it we must first know how to find *any* ordinate of a 1-deg. curve, the middle ordinate being given. Therefore I give the following rule:

To find the length of any ordinate of a curve: 1st. From the *middle ordinate* of the *given chord* subtract the *middle ordinate* of a chord measured by twice the distance between the ordinates; result will be the length of the first ordinate on either side of the middle ordinate. 2d. To find the second ordinate on either side of the middle one, you must double the length of your second chord and so on, adding twice the distance between the ordinates to the length of the second chord, third chord, etc., according to the position of the required ordinate.

To make this important rule plain without the use of a diagram, let us say it is required to find the length of an ordinate to be drawn fifty feet distant from the middle ordinate of a 1,000 feet chord, and say the length of this middle ordinate is found to be 100 feet. Now double the distance between the ordinates is 100 feet. Calculate the middle ordinate of a chord of 100 feet, and subtract it from the given middle ordinate. Result will be the required ordinate.

It will readily be seen to what use this rule may be put by the engineer in superintending the finishing up of earthwork and trestlework on curves, and it is invaluable for curving rails in track laying.*

* The suggestions of "J. J. D.," in the GAZETTE of August 17, will receive attention.

The next paper of this series will contain the best methods of railroad leveling. HOOSIER.

Boiler Incrustations and Water Supply.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your paper of August 10 I notice an article entitled "The Master Mechanics' Association—Next Year." In enumerating the subjects to be considered at the meeting next year you name "The Operation and Management of Locomotive Boilers, including the Purification of Water." You say, "few who have not had some experience in the West can realize the extent of the evil of impure water; and the loss in fuel from this cause is annually very great. As yet no effectual remedy has been proposed, and hardly any mitigation of the evil.

"The great surprise is, that it has not attracted more attention from chemists and others engaged in kindred occupations. * * * * * Judging from past experience, we are not hopeful that such a remedy will be found, unless the inquiries of those who investigate the subject take an entirely new direction."

I do not lay claim to much knowledge of chemistry, or to being a scientist, but in many years of railroading I have realized the "extent of the evil of impure water." I heard a master machinist, in charge of the motive power on an important railroad in Illinois, assert that it cost his company $2,000 per annum for each locomotive in use for impure water above what it would cost if pure water were used. And he offers such proof as convinces one of the probable truth of his statement.

The item of fuel is not the only one to be considered in connection with this subject. It is not a small matter that the locomotive must go to the shop every few months and be out of service for a time while the flues are taken out and cleaned, and the inside of the boiler cleaned of mud, etc. There is something startling in the thought that a railroad with a hundred locomotives is wasting two hundred thousand dollars per annum in consequence of using impure water for its locomotive boilers.

If any stockholder thinks the picture overdrawn, let him watch the experiment; say, take a locomotive fresh and clean from the shop, test the amount of fuel used in hauling a train a given number of miles, and then after that locomotive has been in use six months make another test with, as near as may be, the same conditions. He will find such a difference as will surprise him, if he has not previously given the matter a test. So far as I know, the experiments heretofore tried in seeking to overcome the difficulty, have been *in the boiler*, leaving the lime and other impurities where they are not wanted. Is it not possible to purify the water before it enters the boiler? Perhaps it can be done by raising the water in the tank—water station—to the boiling point. Will not ebullition cause the lime to "seek its level" at the bottom of the tank? But I think the cost of raising the temperature sufficiently for this purpose will discourage any one from seeking a remedy in this direction. Where then is the remedy? *Why use impure water at all?*

Is there a railroad in the country that cannot get a full supply of pure, soft water at far less cost than $2,000 per annum for each locomotive? Is it not feasible for any railroad company to impound and save the soft water that falls from the clouds? Are there not on all the railroads, at suitable distance from each other, depressions where, by scraping off the soil and making dams and embankments, sufficient water can be stored for use through the driest season? I think it has been demonstrated that in New England the evaporation amounts to about 27 inches per annum. In Illinois and Missouri it may be 36 inches. But we never have 12 successive months without sufficient fall of rain to fill these reservoirs—generally not more than two or three months at a time. There are portions of the West where it is difficult to get a sufficient supply of water for a railroad from wells. Twice in the past five years some of the railroads in Illinois have been for weeks at a time crippled for lack of water. Is it not strange, that instead of spending thousands of dollars for *prospecting* for water veins under the surface, and other thousands in digging wells containing a scanty supply of hard, lime water, managers of railroads do not try to save some of the soft water a bountiful Benefactor provides for their use? M.

Conscience Money.

C., B. & Q. R. R. Co., CHICAGO, August 21, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The "original" of which the inclosed is a copy came to me inclosing the sum of $1.20 "conscience money."

Assuming there may be others in the condition of our unknown friend, who may only need the force of a wholesome example that they may do likewise, I am led to send you the bit of "leaven" that you may place it before your readers if you choose, and allow it to do its "good work."

Yours truly,

SAM'L POWELL, G. T. A.

[COPY.]

"——, Ill., August 17, 1872.

"MR. SAM'L POWELL:

"DEAR SIR: Some 13 or 14 years ago I obtained a ride upon the C., B. & Q. cars under wrong pretenses, and it has been anything but a source of comfort to me ever since.

"I know that the C., B. & Q. R. R. Co. is wealthy, and I am poor, or at least not worth much, but that does not justify me in doing wrong.

"If I recollect right, the fare at that time was 65 cents, the interest on it 14 years at 6 per cent. would be in the vicinity of $1.20. I have rode several times on your road without paying, but not fraudulently.

"Yours respectfully,

"P. O. Box ——."

A Formula for Frogs.

TUNKHANNOCK, Pa., August 23, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your number of August 10 I notice a paper signed by "L." who wishes a formula for finding the distance from the point of frog to the head-block.

As simple a formula as I can give for that purpose, which, although not theoretically correct, differs from the truth but very little, would be as follows:

Let l = the distance required in length of the frog for one foot spread;

g = gauge of track;

d = throw of switch.

As in a previous paper,

$D + s = 2gl$; but,

$s = 2l\sqrt{gd}$; whence $D = 2l(g - \sqrt{gd})$.

A mathematically exact formula would require five times the calculation, and will not give results to differ from those found by the preceding, in any case that I have ever had occasion to try, by one-half of an inch.

Because I do not enter into mathematical niceties here, I hope none of your readers will class me among the despisers of formulæ, for I consider nothing can be easier to use, nor more ready when desired. I fear that without the experience of some mathematical engineers who changed some correct rules to approximations for those deficient in the veriest rudiments of the business, there would be very few of them to be found. T.

The Narrow Gauge—Mr. Evans' Questions.

No. 115 BROADWAY, NEW YORK, August 12, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE.

In your issue of the 10th inst. you published an extract of an article from the pen of Mr. W. W. Evans, civil engineer, in which he advocates broad-gauge railroads. I read the extract with pleasure, because the weakness of the arguments advanced by Mr. Evans against the narrow-gauge system, which I prefer, is a further proof of the soundness of this system.

As I am on the eve of leaving the country, I am unable to devote the time which the answers to the forty-eight questions suggested by Mr. Evans would require, but I will state my opinion on some of them.

On the subject of embankments, Mr. Evans says:

"10th. In embankments, is there any good reason why they should be any wider for standard gauge than narrow gauge, beyond a vertical, longitudinal slice placed in the center 14½in. width, the difference between 3ft. 6in. and 4ft. 8½in. This in an embankment 50 feet high makes 1⅛ per cent. difference in quantity and cost, but only for so much as is 50 feet high.

"11th. Where the line is a surface line, or very nearly so, will there be any difference in the cost of foundation between the narrow and standard gauges?"

Which means:

1st. That Mr. Evans fixes at only 14½in. the width of the longitudinal section which has to be deducted from the central prism of every embankment.

2d. That Mr. Evans fixes at 0 and 50 feet the altitudes which are to serve as limits of comparison.

3d. That only in embankments 50 feet high is there a difference of 1⅛ per cent.

4th. He asserts that when the altitudes are only a little above zero, there is no difference.

I will examine each of these deductions in detail.

1st. In order that the section to be deducted should be only 14½in. wide, as Mr. Evans asserts, it would be necessary that a ten-feet road-bed being the accepted width of the embankments of a narrow-gauge road (as claimed alike by partisans and opponents), the broad gauge should have a road-bed of 11ft. 2½in., which is not correct. The narrowest road-bed of embankments of broad-gauge roads is 14ft., and in confirmation of this fact I can cite the following authorities: Rankine, Vose, Gillespie, Reynault, Perdonet and Claudel. Consequently the width of the section to be submitted would be the difference between the width of the narrow-gauge road-bed and fourteen feet, that of the broad-gauge road-bed, or four feet.

Secondly. I hardly know how to account for the fact that Mr. Evans quotes the very instances which occur most rarely in the construction of railroads. Perfectly level superfices are scarcely ever met with, and embankments 50 feet high occur very rarely, or for any distance; these instances can be classed as exceptional. Let Mr. Evans glance over the many roads in Peru which he quotes; let him read the reports of Mr. Young-husband and Mr. Thorndike on the railroads from Mollendo to Arequipa, and from Arequipa to Puno; let him examine the elevations of the railroads from Chimboto to Huaraz, from Puno to Cuzco, and from Huacho to Sayan, and he will find proofs of what I assert. The railroad from Arequipa to Puno, for instance, is 357 kilo. long, and in this distance the movement of earth is 7,770,330 cubic metres, and as the road-bed is 4.30 meters, the average elevation would be 2.635 meters, equal to $8\frac{7}{10}$ English feet.

If we examine the railroads of this country, and take, as an example, the Pacific Railroad, we find that only in the transit across the Rocky Mountains and across the Sierra Nevada are there works of such a magnitude—that is to say, over an extent of some 300 miles; while in the remaining 1,300 miles of the road the embankments do not exceed 4, 5, 6 and 7 feet in height. This can be verified by an examination of the official report of the Secretary of War, to which are appended the enlightened reports of General McClellan.

The Baltimore & Ohio road affords another example. This road has unquestionably been, if not the most difficult, one of the most difficult, to build in the United States. Nevertheless the movement of earth on it was 16.78 cubic yards for every lineal yard, and as its road-bed is 26 feet wide, its average elevation is 4.44 feet. Only in the thirteen first miles were there any works of magnitude, such as the cutting near Baltimore, 70 feet high, and the embankment across Gadsby's Run, 57 feet high. The grading of the thirteen first miles cost $8,994,— more than that of the remaining 54¼ miles.

Passing from the United States to England, we find that at the end of 1848 there were in the latter country 5,000 miles of railroads, which had required an earth movement of 250,000,000 of cubic yards, equal to an average elevation of 7.64 feet.

That is to say, in Peru we have an average elevation of 8.613 feet, in this country 4.44 feet, and in England 7.64 feet. The average of these three is 6.90 feet, a figure very far from the one selected by Mr. Evans for the groundwork of his arguments.

If my object were to adduce arguments in favor of the narrow gauge irrespective of complete soundness, I should avail

myself of the average elevation of the Baltimore & Ohio Railroad, in which case the difference between the two systems would be 19.36 per cent. in favor of the narrow gauge; but as I seek solely the elucidation of truth, I think it more satisfactory to base comparisons on the data furnished by the great extension of railroads in England, among which roads are the Liverpool & Manchester, the North Midland and the London & Brighton, all excessively expensive in the earth movements required. Taking then the average elevation of 7.64 feet, the difference is one of 15.71 per cent., and not of 1 4-10 per cent., as Mr. Evans asserts.

Further, even taking the elevation of the embankments at 50 feet, the difference would not be 1 4-10 per cent., as claimed by Mr. Evans, but 4.49 per cent., because, as will be seen further on, the progression corresponding to any elevation is $u = a + (n-1)\,d$; in which a, equal to the first term, = 3.875; n = number of terms, = 50; $n-1 = 49$, and d, the ratio, = 0.375; carrying out the calculation gives 4.49, which is contrary to the assertion made by Mr. Evans.

In regard to the last two points of his proposition Mr. Evans has been equally incorrect.

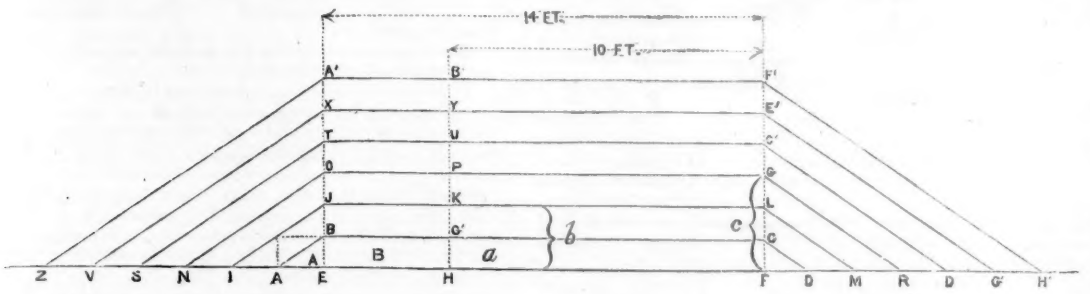
To convert a broad-gauge embankment into a narrow-gauge one, a section of the central prism along its whole length and of the width already stated must be subtracted; thus the diminution would be proportionate to the height of the prism; but as nothing is deducted from the slopes, they follow in their construction the constant rule which they obey, in virtue of which the difference between both entire prisms is in inverse ratio to their heights. Thus it will be found that, taking for instance the average elevation of 7.64 feet, the difference is 15.71 per cent. If we take an elevation of 4.44 feet, the difference is 19.36 per cent., and if, finally, we take an elevation of 1 foot, the difference is 25.80 per cent., which is entirely contrary to the assertion of Mr. Evans.

The following demonstration strengthens what I have said upon this subject:

Prisms having equal altitudes are to each other as their bases: consequently, what may be demonstrated with respect to the one will be true with respect to the other.

Let *abcd* be an excavation or embankment one foot high, 14 feet wide in road-bed, and with slopes of 1½ to 1.

Let us suppose the section to increase foot by foot.



The triangles *ABE, IJE, NOE*, etc., being similar, their surfaces are directly proportional to the square of their altitudes; consequently, $IJE = 4 \times ABE$, and $ABJI = 3 \times ABE$.

By the same principle we could demonstrate that $IJON = 5 \times ABE$, $NOTS = 7 \times ABE$, and $STXV = 9 \times ABE$; an arithmetical progression whose difference is 2 *ABE*.

The parallelograms 2 *ABE* and *EBG'H* have also the same altitude, consequently their surfaces are to each other as their bases. The parallelograms *EBG'H* and *HG'OF* have also the same altitude, and their areas are to each other as their bases, or as 4 is to 10.

By these principles, the results obtained for the different areas follow the law of an arithmetical progression in which the difference is 0.375, from which we see that when the altitude is 1, the quotient of the total prism divided by the subtracted section is 3.875; and, when the altitude is n, the section will be $3.875 + (n-1)\,0.375$, as can be seen in the following table, in which a represents the trapezium *ABCD*, b " " *IJLM*, c " " *NOQR*:

Sections.	Altitude.	Areas. Gauge. 4ft. 8½in.	Areas. Gauge. 3 ft.	Areas. Difference.	Percentage in favor of Narrow Gauge.
Section a....	1	15,500	11,500	4.00	25.80
" b....	2	34,000	26.0 0	8.00	23.53
" c....	3	55,500	43.500	12.00	21.62
" d....	"	"	"	"	"
" e....	"	"	"	"	"
" z....	50	44,50	4250	200.00	4.49

I have only to observe that from the demonstration which I have made with regard to embankments, logical consequences are deducible which prove that there are economical conveniences also in everything which has close relationship to said embankments; for instance, in cuttings, lands, grubbing, side-drains, culverts, abutments of bridges and retaining walls; but as I stated previously, I cannot now spare time to enter fully into the discussion of the subject. On my return I intend to do it in a report, which at the request of the American Society of Civil Engineers I hope to read at one of their sessions.

F. J. CISNEROS.

—Selah Chamberlain, one of the directors of the Milwaukee & St. Paul Railway Company, and for many years prominent as a railroad man, has been nominated for Congress by the Democrats and Liberals of the Twentieth Ohio (Cleveland) District.

Machinery for Sinking the Piers for the South Street Bridge, Philadelphia.

BY D. M. STAUFFER.

The engravings accompanying this article represent in a general way the "plant" or appliances used in sinking, by the Plenum Pneumatic Process, the iron cylinders which form the piers of the bridge now being built by the city of Philadelphia over the Schuylkill River at South street. Compressed air has but very recently been employed in the founding of bridge piers and other engineering works in this country; but it has already proven itself a valuable assistant to the engineer, and in our Western rivers especially it has made comparatively easy the otherwise impossible task of sinking piers through deep beds of quicksand, and has furnished firm foundations on the bed rock for the bridges now spanning the Western rivers.

The manner in which the engineer makes use of this new agent is almost unknown to the generality of readers, and for their benefit we will attempt to describe as briefly but as clearly as possible the method employed at the South Street Bridge in Philadelphia.

The cylinders used are cast of the best cold-blast charcoal iron, made in sections 10 feet long each and 1¼in. thick, varying in diameter from four to eight feet, according to their location in the work. Each section has at top and bottom an inside flange projecting 2¾in. and pierced every 5in. with holes for the bolts which join the sections together. In that section, however, which forms the bottom of the column, when in position, the bottom flange is omitted, giving greater facility for penetrating the soil as the cylinder sinks. The distance from the surface of water to the rock bed having been ascertained by boring, enough of the sections to reach the rock and at the same time extend at least ten feet above the water level were bolted together, the joints being made air and water-tight by a careful luting of red lead and cotton fiber. The average depth of the bottom soil overlying the rock being only about 18 feet at the site of this bridge, and the water at mid-tide about 22 deep, five or six sections were sufficient to reach the required distance.

As the sections of cylinder are both heavy and unwieldy, a strong floating support of some kind is necessary while we are bolting them together, and to assist us in bringing the columns into position, with regard to line and distance, when it is bolted together and ready to drop. For this purpose two canal boats strengthened by inside bracing were used, as shown in longitudinal and cross section, in figs. 1 and 2. These boats lie parallel to each other and distant about fifteen feet. They are moved about or held in position by four anchors—one at either stem or stern. Stretching across the opening between the boats and resting on them is a pair of "clamps" (fig. 2), each clamp formed of three heavy beams 18in.x12in., and capable of being drawn together by two strong iron rods, placed about 9 feet apart, and provided with nuts and washers at each end of each rod. When a section of cylinder is placed within the rectangle formed by the pair of clamps and the two clamping rods, and the nuts on these rods tightened up, the friction will securely hold the section or sections in its grasp; and when we are ready to let the whole column glide to its place on the bottom these same clamps and rods regulate the rapidity of the descent and are capable of stopping it at any point.

The four-footed derrick or shear shown in the engraving is for the purpose of handling the sections as they are being bolted together, which is accomplished as follows: The first section, to form the column, is lifted by the heavy hoisting tackle of this derrick from the deck of the boat and lowered into place between the clamps, and securely held there by the tightening up of the nuts; the tackle can then be cast loose and another section raised up and placed upon the first, and the two bolted together, to obtain sufficient head room for a third section. The clamping rods are carefully slackened, and the two sections allowed to slip downward slowly, until the second section occupies the place of the first between the clamps and is in its turn clutched there. This process is repeated until the requisite number of sections are joined together, or until the bottom of the column is within a foot or two of the mud. Then we are ready to haul the boats and their load into position, and, slackening up the rods, let the column settle into the mud as far as the weight of metal will carry it.

The "air lock" which caps the cylinder—and is its most important feature—is shown as occupying the upper section of all, in the two engravings. In forming this lock, two heavy cast-iron circular plates or diaphragms, 1¼in. thick, are used, of the same diameter as the column. One of these plates, making a floor to the lock chamber, is placed between the first and second sections of the cylinder, counting from the top; and the other, or the roof, is on top of the first section; the portion of cylinder ten feet high included between these plates forms the sides of the "air lock." The diaphragms are held in place by the same bolts that unite the two sections of the cylinder, and, besides a central trap-door, are pierced with three openings each—one for the "air-supply pipe," shown on the left of the lock in fig. 1; another for the "water-exhaust pipe," shown on the right of the lock in same figure, and a third for the "equalizing pipes," occupying a middle position between the two in the engraving, but really only about 9 inches from the farther side of the lock chamber. The central door is from 20 to 30 inches in diameter, according to the diameter of column. It fits snugly against the diaphragm by means of a gum washer, and opens downward. A "keeper" on top holds it in place when shut. When it becomes necessary to increase the length of the column by the addition of new sections, these diaphragms need not be moved, but the additional sections bolted immediately on top of it. The general arrangement of this air lock is that of Mr. J. W. Murphy, Contracting Engineer of the bridge.

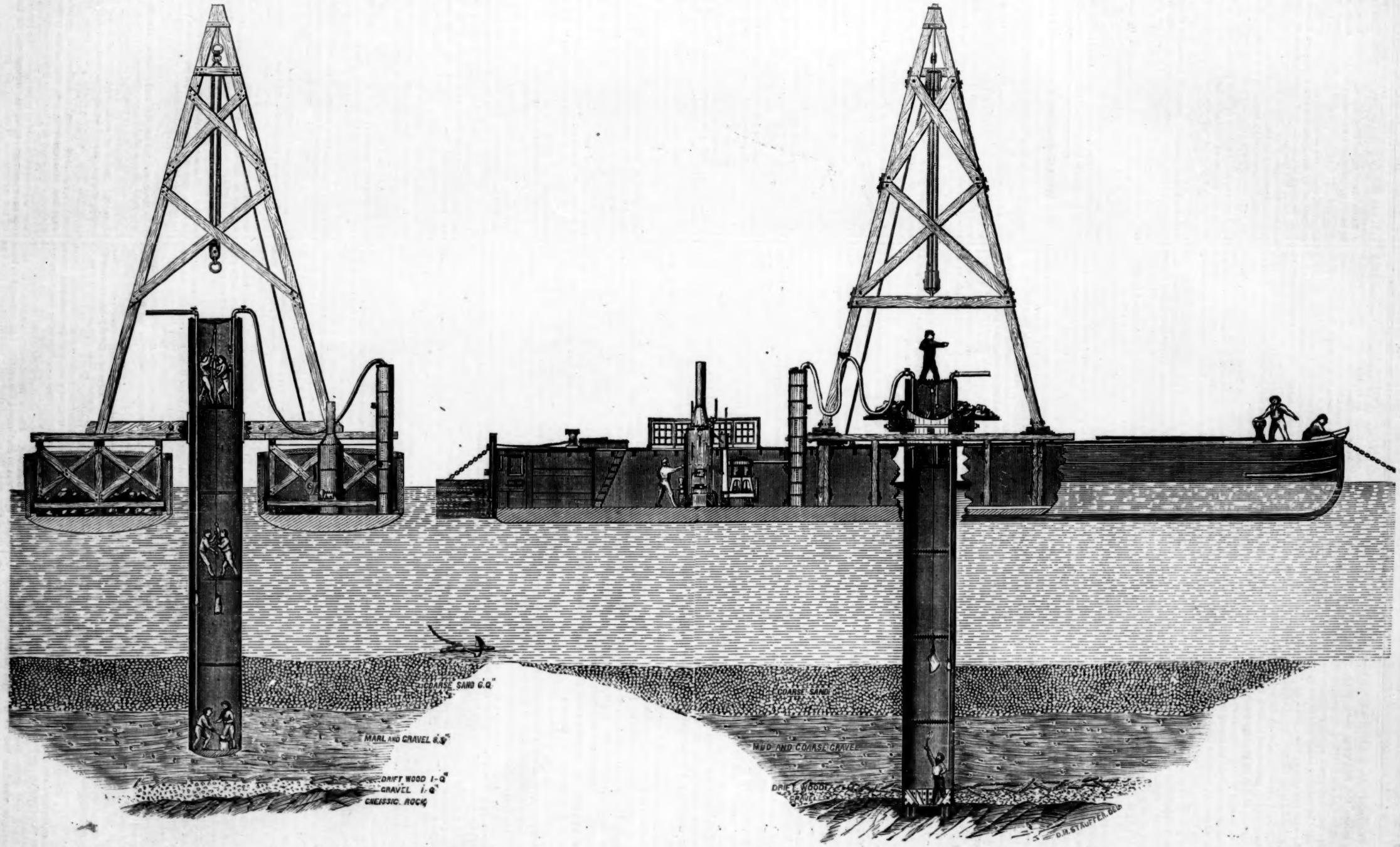
The compressed air used in the process is furnished by a nine horse-power "Burleigh Compressor"—a very neat, compact and effective piece of machinery—stationed on one of the boats, as shown in fig. 1, with its accompanying boiler. This compressor consists essentially of a pair of cylindrical air pumps, acting vertically and alternately. The air is drawn in through a clack-valve in the piston head, in the downward motion, and by the return stroke is forced through a communicating pipe into the storing reservoir, shown immediately to the left of the cylinder in the engraving. This reservoir was originally a steam boiler 22 feet long by 3 feet in diameter, and in case of any accident stopping the pumping machinery, will furnish condensed air to the column for one-half hour, allowing the workmen within the column that time in which to escape. It is furnished with pressure indicator and safety valve.

When the column is located and sinks into the mud from the clamps, the water of course rises within to the normal level of the river; and before the workman can enter and commence the excavating process, this water must be expelled and kept out. It is here we make use of the compressed air, and the manner of applying it is as follows:

The door in the lower diaphragm must be first tightly closed and fastened—thus cutting off communication between the outer air and that part of the cylinder below the floor of the air lock; the compressing machinery is then started, and the air is gradually condensed in the reservoir and is conveyed from it through the flexible hose, shown in the engraving, to the air supply pipe, and through this pipe into the lower section of the cylinder. The compressed air passes in this way directly through the air lock, but does not communicate with it, emptying under the floor of the lock. As the condensed air enters the lower part of the column it commences to drive out the water from under the lower edge of the cylinder, and, as the pressure becomes sufficiently great to counterbalance the depth of water in the river, the water will be completely driven out and replaced by the compressed air, which from this time forward is being steadily pumped in. Should the column have sunk into a stratum of mud impervious to water, as is often the case, we cannot drive it out from below, but must have recourse to the "water-exhaust" pipe, shown on the right of the column in fig. 1. This pipe extends through the air lock through packed joints, and terminates in an elbow provided with a stop-cock at top. Its lower part is formed of two pipes, the one a little larger than the other and slipping over it, thus enabling the men to raise or lower the lower end. When the stop-cock at top is opened, the pressure of the denser air on the water surface in the column will lift the water through this pipe and discharge it with violence out over the top of the cylinder.

The next step in the process is the entrance of the men into the working chamber, with its dense atmosphere, and the office of the "air-lock" is to pass them into this atmosphere from the air outside the column. The gang descend into the lock chamber by a rope ladder, and when in, close the upper door and fasten it, isolating the air in the lock from outside influence. By then operating the "equalizing" pipe in the floor of the lock chamber, compressed air is slowly let into this chamber, and the air in it gradually becomes more and more dense until it equals in pressure the atmosphere at that part of the column below the "air lock." When this point is reached, and only then, can the door in the lower diaphragm be pushed open. A rope ladder is now lowered to the bottom, the men descend, and work begins. If it is a first experience, and the men are unaccustomed to the effect of the unnatural pressure, great caution must be observed in the admission of compressed air into the "air lock," otherwise, by letting it in too suddenly, serious danger—and in any case great pain—might result.

The mud, sand or gravel which fills to a considerable extent the bottom of the cylinders is taken out in canvas bags, each bag holding about one cubic foot. The working gang generally consists of six men inside at a time; the time of labor four hours, unless the depth is very great and the pressure consequently heavy. The work is pushed forward day and night, the laborers being divided into three gangs, so that they have four hours on duty and eight off. Under favorable circumstances, six men will take out about three cubic yards of material in a four-hour shift. One portion of the gang will fill the bags at the bottom, and the others hoist them into the air lock by a block and fall and pile them up around the sides of the lock, until their time has expired. When the men wish to go out, they all ascend into the lock, close the lower door again, and, reversing the process by which they entered, let the compressed air in the lock escape outside by opening the "equalizing pipe" in the roof of the lock chamber. When they have reduced the pressure within to that of the normal atmosphere, the upper door can be opened and the men are once more outside. The bags of debris are emptied into the river, and another gang enter and repeat the operation. If the material has



MACHINERY FOR SINKING PIERS OF SOUTH STREET BRIDGE, PHILADELPHIA; DESIGNED BY J. W. MURPHY, C. E.

been excavated down to a level with the lower edge of the cylinder before the last gang came out, a "sink" is made before the entrance of the relieving gang. To make this "sink," the compressor is stopped, and communication between the reservoir and the working chamber cut off by closing a valve at the point where the rubber hose joins the "air-supply pipe." The compressed air in all the cylinder is then allowed to escape through the equalizing pipe in the lower diaphragm, the water will immediately commence to rush in under the lower edge of the column, and in its passage so loosen up the soil as to facilitate the sinking of the column a fresh distance. The weight of iron, no longer upheld by the upward pressure of the condensed air, is, of course, brought fully into play. When it has sunk as far as it will go, the water is again forced out and the column is ready to be excavated as before.

The lifting power of compressed air being very great—almost one ton per square foot of area for every atmosphere—in a column of large diameter, there is imminent danger of raising it bodily when the pressure against the diaphragms exceeds the weight of metal in the cylinder and the friction of the material penetrated. To overcome this tendency to rise, the clamps are hoisted clear of the boats, as shown in fig. 1, and fastened to the cylinder itself; a strong platform placed on these clamps supports a mass of stone sufficient in weight to more than counterbalance this upward pressure and to serve as an additional effective weight when a sink is made.

When the column has reached the bed rock of the river, this rock is chiseled down to a level bearing and prepared for the reception of the foot pieces or brackets shown in place in fig. 1, and rendered necessary at this place by the insufficient holding ground. These brackets are made in sections, of cast iron, and weigh 940 lbs. each in an 8-foot column. They go completely around the inner circumference of the column. Each bracket is fastened to the cylinder by four tap-bolts, and to the rock by four bolts with fox-wedges at bottom and thread and nut on top. These foot-pieces add much to the stability of the work. They were designed by Mr. Murphy.

The column once fastened to the rock the work is almost done, and it only remains to fill it to the top with rough rubble masonry laid in hydraulic cement. The first ten feet of this filling must necessarily be done under pressure, and is laid in a hydraulic mortar of one part cement to one part sand; after that we may safely remove the diaphragm doors, and complete the work of filling as in an open wall.

The columns are now brought to a level by extra sections, cast after the total length to the rock is ascertained, and are braced together outside by I beams and tie rods. Timber cribwork filled with stones protects them from passing vessels and the flow of ice.

The "plant" used by Mr. Murphy, the contracting engineer of the bridge, is worthy of special commendation, from the fact of its combining severe economy with effective work. The appliances were very few in number, as can be seen by referring to the engraving, and the operations reduced to their simplest form.

The effect of compressed air upon the workmen and on the lights used, and other phenomena connected with the application of the Plenum Pneumatic Process, have all been discussed before in your journal by abler men, so we will not take up any more of your valuable space by a repetition of the facts.

The London & Northwestern Railway Works at Crewe.

At the recent meeting of the British Institution of Mechanical Engineers the members visited these famous locomotive works, which are thus described in a letter to *Engineering*:

It would be quite as impossible for us to give here anything approaching a detailed account of the Crewe works as it was to collect the information for such an account in the time available for the visit, and we shall, therefore, direct attention only to some details of special interest.

The first shop visited was the erecting shop, where a number of engines were in progress, and where we noticed in use a little tool which, although we believe it has been some time in use at Crewe, is not generally known, and therefore deserves mention here. This tool is for cutting off the tubes to the exact length required after they have been inserted in the boiler, and it consists of a bar which fits the tube, and which has recessed into it a lever carrying at a point between its fulcrum and its outer end a small cutting tool. A stop, which is adjustable on the bar, and which bears against the tube-plate outside the tube to be cut, allows the bar to be thrust into the tube to just the distance necessary to bring the cutting-tool to the point where the cut is to be made. The bar is then turned round by hand, and the lever carrying the cutting tool being pressed outward by a spring, the cut is made in the course of a few revolutions. The tool does its work quickly and well, and is altogether a very handy one. During the visit of the members to this department also, much interest was excited by the performances of one of the little 18in.-gauge locomotives, which run in and out of nearly all the shops at Crewe, hauling behind them loads which appear ridiculously disproportionate to their size. It is, in fact, positively amusing to witness the cheeky manner in which one of these little engines will walk off with a boiler mounted on a pair of miniature trucks, running round apparently impracticable corners, and backing it into out-of-the-way recesses in a way that must be seen to be appreciated.

In a shop adjoining the erecting shop was a machine for grinding locomotive name plates, the plates being laid in water in a kind of shallow tank, formed by giving raised sides to a massive traveling table like that of a planing machine. As this table traversed to and fro, the frame plates were subjected to the action of a revolving grindstone mounted on a vertical axis, the grinding being performed by what would ordinarily be called the side of the stone. Close by, also, was the plant employed in finishing the wheels and axles, an immense quantity of the latter being in stock. We may mention here that the cost of finishing a crank axle from the forging has now been reduced at Crewe to less than £2, so that the cost of such axles has almost ceased to be a matter of any moment.

From the wheel shop the visitors were conducted through the repairing shops, and here there was seen in use a contrivance for dressing grindstones, which is the invention of Mr. Worsdell, Mr. Webb's assistant, and which deserves to be introduced into every shop where a grindstone is to be found. Everybody who has had to do with dressing a grindstone knows that the process is ordinarily one involving much discomfort, and is, in fact, simply a mode of distributing dust and grit where it is not wanted. By the arrangement now adopted, however, all this annoyance is avoided, and the dressing is effected in a fraction of the time. To attain the desired end Mr. Worsdell simply employs a cast-iron roller about 3in. broad, the circumference of which has a series of fine teeth formed in it. This roller is mounted in a simple kind of slide rest temporarily attached to the grindstone trough, and is forced against the stone as it revolves. The result is that the fine teeth of the roller, as it were, nibble off any prominences on the stone, and, the roller being traversed across the periphery of the latter, performs the operation of dressing perfectly. Moreover, as the stone can be treated wet, there is no dust or dirt, as in the ordinary process.

Close to where the grindstone dressing was going on was to be seen Mr. Webb's admirable little machine for slotting the insides of the rims of locomotive wheels, a machine which we illustrated on page 56 of our first volume; and near it was a modified arrangement of a similar kind fitted to an ordinary slotting machine.

Passing on through the fitting shop, the visitors had an opportunity of examining the new form of injector which Mr. Webb is now fitting to all his engines. An external view of this injector was shown in the illustration of injector mountings which we gave a few weeks ago (*vide* page 423 of our last volume), but we hope shortly to be able to illustrate it in detail. Meanwhile, we may say that it has been designed so as to be very readily constructed, and is admirably suited for its purpose in every way. Here, also, were some of the cast-iron wheels which Mr. Webb is using for some six-coupled engines which are being constructed at Crewe for hauling coal trains at a low speed, these wheels being made of a peculiar mixture which gives great tenacity. In speaking of the fitting shop, it should also be mentioned that Mr. Webb is now leaving his link motion without cleaning up (except, of course, at the joints) after it has been case-hardened. The motion has, in fact, the same style of finish as is adopted by gunmakers, and the effect is very good, while much useless labor is saved.

From the fitting shop Mr. Webb conducted his party into the smithy, where the process of wheel bossing was going on under one of the steam hammers, and we may mention here that in the case of the smaller wheels they are, after bossing, handed over to a second gang of men, and trimmed off during the same heat. The pattern shop was next visited, and here was to be seen a very convenient form of bench of American design, fitted with a neat and simple arrangement for screwing up framed work or forcing home tenons. Next came the millwrights' shop, containing a most miscellaneous collection of machinery, and next the iron foundry, where we found that Mr. Webb is now working his cupolas with closed tops, and in connection with a chimney, and is saving some five and twenty per cent. of blast thereby. This is a practical result of much value to iron founders. In the iron foundry also was to be seen some very well-planned molding machinery for molding the cast-iron chimney tops which Mr. Webb is now using, and which are molded in green sand, and cast with metal only 3-16in. thick.

Another important hint was gained by seeing the way in which mixed brass and iron borings and the refuse from the brass foundry are now treated at Crewe. The separation of brass and iron borings by the ordinary process is a tedious affair, and in some cases scarcely pays for its cost; but Mr. Webb accomplishes the desired object very simply and economically by a smelting process. The mixed iron and brass borings, and the refuse from the brass foundry, are mixed with limestone, coal and oxide of iron or scale, and on this mixture being smelted, the brass settles to the bottom and is tapped and run into ingots. So far as we are aware, this mode of smelting mixed borings and refuse with oxide of iron, so as to obtain a fluid slag, from which the brass readily separates, is an entirely novel one, and we believe that its value will be generally recognized in large establishments.

Before leaving this portion of the works the visitors were shown a number of tested samples of the Bessemer steel plates now being used at Crewe for the construction of boilers. Mr. Webb is adopting steel entirely for the construction of boiler shells, the rivets being also of steel, and he stated that he hopes ultimately to be able to employ the same material for fireboxes and tubes, to the exclusion of copper and brass. The boiler plates used at Crewe are all made on the works, and a sample is cut from every plate and tested. The plates are required to have a breaking strength of 34 tons per square inch, with an elongation of 25 per cent., and a ¾in. hole punched in the sample strip, about 2½in. wide, has to stand being drifted out to ¾in. in diameter without the plate cracking. We should much like all those who have still an antiquated horror of steel could examine carefully the material which is now being used at Crewe. We know that there is much plate steel made which is utterly unfitted for boiler work, but so also is there much plate iron equally unfitted; and as it would be silly to argue from this latter fact that wrought iron is unsuitable for boiler-making, so, also, is it foolish to object to the use of steel simply because some steel is untrustworthy. The present practice at Crewe affords ample evidence that, by proper care, it is possible to produce a material which, for boiler-making purposes, is vastly superior to the very best wrought-iron obtainable, and we consider that Mr. Webb is doing the profession good service by the manner in which he is availing himself of the resources at his command to introduce such a material largely.

We may mention here, by-the-bye, that for some months past Mr. Webb has been running one of his shunting engines at Crewe with anthracite coal. This engine has a steel boiler, tubes and firebox, and is fitted with an arrangement of watergrate which we hope to illustrate in an early number. The performance of this engine has been most satisfactory, and it is probable that water-grates will shortly be applied to other engines, to enable the use of anthracite to be extended.

From the brass foundry a short walk along the connecting line, brought the visitors to the Bessemer steel works, where they found everything ready for a "blow." At this point in the proceedings a most unfortunate hitch occurred. The Bessemer blowing engines at Crewe were originally fitted with Mr. Bessemer's india-rubber ring valves, but some time ago these were removed, and piston valves worked by eccentrics substituted in their stead. These piston valves worked in open-ended cylinders placed at the top of the blowing cylinders some feet above the ground level. On Friday last just before the "blow" was commenced, and while the engines were moving slowly, Mr. Bramwell entered the engine-house, and unwittingly pointed his umbrella at the end of one of the piston valve cylinders. The umbrella was loose, and the rush of air entering the valve cylinder caught it and drew it in, tearing the silk from the frame. At the return stroke of the valve the silk wrapped round the edge of the latter, jamming in between the valve and its cylinder, and actually bringing up the engines. Nobody gets any sympathy for disabling his umbrella any more than he does for smashing his hat, and when Mr. Bramwell's protector from showers was first partially extricated from the valve cylinder in a decidedly fragmentary condition, those present were rather inclined to regard the matter as a good joke. A very little examination, however, showed that the accident was no laughing matter, for the jamming of the valve had thrown such a strain on the valve rod that the rocking shaft, through which the valve obtained its motion, was severely twisted, and one of its plummer block brackets broken. Moreover, the valve was so thoroughly jammed that it was evident that its removal would be a work of time, so that altogether the engine was thoroughly disabled. Under these circumstances the only course open was to disconnect the engine, and attempt to blow the charge with the other engine only, and ultimately this was safely accomplished. The accident was altogether as singular as it was annoying, and it was one which we are certain was most sincerely regretted by all present.

While the disabled blowing engine was being disconnected, most of the visitors repaired to the forge, which, with its magnificent plant, is in itself worth a pilgrimage to see. Here were at work several of Mr. Ramsbottom's duplex hammers, and here, also, was witnessed the process of tire-making, also introduced by Mr. Ramsbottom, a process which we described fully on page 341 of our first volume, when we also gave illustrations of the machinery employed. Another matter of interest was the making of steam dome covers, which Mr. Webb is producing simply by stamping a flat steel plate under a steam hammer, the plate being raised to a red heat. Three blows of the hammer shape the cover perfectly, and two more, with water thrown into the dies, give it a complete finish. The dies used are carefully turned up, and the forgings, when they leave them, are almost as true as if they had been turned in a lathe. Here, also, was to be seen the rolling of steel axles in rolls having grooves of varying depth, so as to give to the axles the requisite variation of diameter, while there were also Mr. Ramsbottom's admirably planned reversing rolling mills—the engines driving them being reversed by hydraulic power—and numbers of other arrangements for turning out heavy work with the least possible amount of manual labor, which we cannot even mention here.

From the forge a hurried visit was paid to the boiler shop, and then, after witnessing the commencement of the "blow," which had been interrupted by the failure of the blowing engine, the visitors adjourned to an excellent luncheon, which had been provided, and this being dispatched, they were conveyed by special train to Liverpool.

What Constitutes Baggage of Traveler.

Both the American and English adjudications upon the subject of baggage or personal luggage establish the doctrine, beyond contradiction, that the liability of common carriers as for goods does not extend to articles retained by the traveler in his own custody. But as to that portion of a traveler's luggage committed to the charge of the carrier a different responsibility exists, and there are numerous cases reported in which the rule of liability is discussed. There is almost exact uniformity among the decisions as to the rule, but there is some discrepancy as to the application of it. In a recent case in New York the rule was laid down to be, that "carriers of passengers are responsible for the carriage and safe delivery of such baggage as, by custom and usage, is ordinarily carried by travelers, and that the payment of usual fare includes, in contemplation of law, a compensation for the conveyance of such baggage." That the carrier is an insurer of such baggage or personal luggage, in the same manner and to the same extent as for goods or freight, is the settled law. But the great question which has occupied the attention of the courts and puzzled the judicial mind is what constitutes "personal luggage," or "ordinary baggage," in the rule of liability laid down? In England there is an act of Parliament styled the Carrier's Act which makes it the duty of railway companies, etc., to carry a certain quantity of luggage, but in terms limiting it to "ordinary luggage." This very ambiguous phrase, corresponding to what may be regarded as the *common law* phrase "ordinary baggage," in America, has been the subject of legal interpretation in at least half a dozen well-considered and elaborately argued cases in the higher courts of England. In Cahill *v.* The London & Northwestern Railway Company, it appeared that a passenger presented to the company as luggage a box containing only merchandise, but not exceeding in weight the limit prescribed for personal luggage. No information was given to the company of the contents of the box. *Held*, that he could not recover for the loss of the box. Chief Justice Cockburn, in his case, said: "If a railway company * * * * choose to take as ordinary luggage that which they know to be merchandise, I quite agree that it is not competent for them, in the event of a loss, to claim exemption from liability on the ground that the article consists of merchandise and not of ordinary luggage. But, on the other hand, if a passenger who knows, or ought to know, that he is only entitled to have his ordinary personal luggage carried free of charge, chooses to carry with him merchandise for which the company are entitled to make a charge, he cannot claim to be compensated in respect of any loss or injury by the company to whom he has abstained from giving notice of the contents." And the same doctrine was enunciated by Park, Baron, in The Great Northern Railway Company *v.* Shepherd, 8 Exch. 30.

In this latter case the passenger presented to the carrier for transportation as luggage a carpet bag, a deal box about two feet long, and two brown paper parcels wrapped in a blue checked handkerchief. The carpet bag contained some books and two handkerchiefs—the bag and these articles being valued at £1 3s. 6d. The bag also contained ivory handles, as did also the box and parcels, to the number of 283 dozen. *Held*, that the passenger could recover for the loss of the bag, the books and handkerchief, but not for the loss of the handles, the carrier not being informed of the fact that these articles of merchandise were contained in the luggage presented for carriage.

In Phelps *v.* The London & Western Railway Co., 19 C. B. N. S. 321, it was held, that the term "ordinary luggage" does not include title-deeds belonging to a client which an attorney is carrying with him in his bag or portmanteau, for the purpose of producing on a trial in a court of justice; nor bank notes (to a considerable amount) carried by him for the purpose of meeting the contingencies of the suit. Earl, C. J., in this case, said: "It is agreed on all hands that it is impossible to draw any very well-defined line as to what is and what is not necessary or ordinary luggage for a traveler; that which one traveler would consider indispensable would be deemed superfluous and unnecessary by another. But the general habits and wants of mankind must be taken to be in the mind of the carrier when he receives a passenger for conveyance."

In Belfast & Ballymena Railway Co., etc., *v.* Keys, 9 H. L. 556, it appeared that the passenger took with him into the car of the company a traveling case of the value of £5, containing watches to the value of £1,895. In the course of the journey a guard of the company applied to him and desired that the case might be removed to the luggage van, and it was so done.

The case was lost and the passenger brought suit to recover for the contents, not averring in any of his pleadings that the carrier had notice or knowledge that the case contained watches or even merchandise, and with that knowledge accepted it to be carried as personal luggage. *Held*, on appeal to the House of Lords, that the passenger could not recover for the loss of the watches.

In Hudstan *v.* The Midland Railway Co., decided in 1869, it was held that a child's toy called a spring horse, 78 lbs. in weight and 44 inches in length, standing on a flat surface, is not within the regulations of a railway company allowing passengers 112 lbs. of *personal luggage* (not being merchandise or other articles carried for hire or profit) free of charge.

In this case Hayes, J., said: "The term 'personal' or 'ordinary' luggage must vary according to the usages of mankind; for example, certain districts of America may be so ill supplied with comforts and conveniences for travelers as to make it reasonable for them to carry extraordinary things with them; and in some districts a pistol may be part of the ordinary accompaniments of passengers. In former times it would not have been safe to travel without one in the neighborhood of the metropolis (London) for protection against robbers, though now it would be an exceptional thing." * * * "A

person might travel often and never see an article such as this (a spring horse) carried as part of the personal luggage of a traveler; it is clearly exceptional. In Macron *v.* The Great Western Railway (decided June 7, 1871), a passenger brought suit to recover the value of the contents of a box received by the defendant carrier as personal luggage. Among the articles which were in the box were six pairs of sheets, six pairs of large blankets and six large quilts which had formed part of the passenger's household furniture, and which he intended to form part of his household furniture at the end of his journey. At the trial the jury found the sheets, blankets and quilts were personal luggage; but the Court of Queen's Bench, on appeal, decided that these articles were not personal luggage within the meaning of the law. Cockburn, Ch. J., in delivering the opinion of the Court, laid down the following sound and comprehensive rule: "Whatever the passenger takes with him for his personal use or convenience, according to the wants of the particular class to which he belongs, either with reference to the immediate necessities or to the ultimate purpose of the journey, must be considered as personal luggage." "This would include," the learned judge continues, "not only articles of apparel, whether for use or ornament, * * * but also the gun case or fishing apparatus of the sportsman, the easel of the artist on a sketching tour or the books of the student, and other articles of analogous character, the use of which is personal to the traveler, and the taking of which has arisen from the fact of his journeying. On the other hand, the term 'ordinary luggage' being thus confined to that which is personal to the passenger, and carried for his use and convenience, it follows that what is carried for the purpose of business, such as merchandise or the like, or for larger or ulterior purposes, such as articles of furniture or household goods, would not come within the description of ordinary 'luggage,' unless accepted as such by the carrier."

There are numerous American cases which are directed to the interpretation of the phrase "ordinary baggage" as embodied either in statute or common law. The following articles have been held to be included among those which it is usual for persons to carry while traveling: A watch and such jewelry as is usually worn about the person, tools used by the passenger in his trade, guns for sporting purposes and a small amount of material for clothing, in a passage from Europe to America, and money for traveling expenses. In Merrill *v.* Grinnell, 30 N. Y. 594, upon the question of a reasonable amount of money for traveling purposes, it was held that the "amount must be measured, not alone by the requirements of the transit over a particular part of the entire route to which the line of one class of carriers extends, but must embrace the whole of the contemplated journey, and includes such an allowance for accidents or sickness, and for sojourning by the way, as a reasonably prudent man would consider it necessary to make."

In this case, $800 in gold coin in the passenger's trunk was not considered to be too large an amount; the intended journey being from Hamburgh to New York and San Francisco. In Dunlap *v.* The International Steamboat Co., 98 Mass. 371, it was held that the United States statute of 1851, exempting masters and owners of seagoing vessels from liability as carriers for the loss of platina, gold, gold dust, silver, bullion or precious metals, coins, jewelry, bills of any bank or public body, diamonds or other precious stones, shipped and laden without notice to them and entry on the bill of lading, does not apply to the carriage of passengers with luggage, and that a passenger by a vessel can recover for the loss of money contained in his valise necessary to defray his traveling expenses. But in The Ionic (5 Blatch. 538), it was held that a gold watch and chain of the value of $471, gold ornaments for presents of the value of $450, and American coin to the amount of $60, were not comprehended within the baggage which a passenger from Yucatan to New York might carry.

In Dexter *v.* The Syracuse, Binghamton & New York Railroad Co., it appeared that the plaintiff purchased in New York, and checked over the defendants' road as baggage, a trunk and contents, consisting of wearing apparel for himself and wife, articles for members of his family, and cloth for some dresses, including one for his landlady. The trunk was lost, and, in an action to recover the value of it and contents, it was held that defendants were liable except for the cloth purchased for the landlady.

In Mississippi Central Railroad Co. *v.* Kennedy, 41 Miss. 671, the trunk of plaintiff contained, among other things, two silver and two gold watches, and the Court held "that the watches in the trunk, the plaintiff wearing one upon his person, were clearly no part of his baggage." See, also, Bomar *v.* Maxwell, 9 Humph. 621, where it was held that a watch alleged to have been in the trunk lost did not fall within the meaning of the term baggage.

In Toledo, Wabash & Western Railroad Co. *v.* Hammond, 33 Ind. 379 (to appear in 5 Am. Rep.), it was held, approving Doyle *v.* Kiser, 6 Ind. 242, that the articles of property treated as baggage * * * may be clothing, traveling expense money, a few books for the amusement of reading, a watch, a lady's jewelry for dressing, and an opera glass. In Hopkins *v.* Wescott, 6 Blatch. 64, it was held, that manuscript books, the property of a student, and necessary to the prosecution of his studies, are baggage. In Minter *v.* Pacific Railroad, 41 Mo. 503, it appeared that the passenger delivered his trunk and a piece of carpeting to the baggage master of a railroad company, who checked the trunk, but told the passenger that no check was necessary for the carpet, as it would go safely. *Held*, that the company was liable for the loss of the carpet, although the action of the baggage master was in violation of the rules of the company.

It will be observed from the leading cases here set forth that the courts are disposed to allow the passenger sufficient latitude as to the kind and variety of luggage which he shall take. The principal disagreement occurs with reference to the question whether a watch ought to be carried in a trunk or other receptacle for baggage—the cases being about evenly divided upon the point.—*Albany Law Journal.*

Warsop's Aero-Steam Engine.

We are indebted for the following description of this engine to the report of the recent annual meeting of the Institution of Mechanical Engineers given in *Engineering:*

The special train used by the members of the Institution of Mechanical Engineers during the excursion of which we have been speaking was hauled by a locomotive which itself possessed a special interest from its being fitted with an air-compressing pump for injecting air into the boiler on Mr. Warsop's system, of which we have on several occasions spoken in these pages. The locomotive to which we now refer is No. 369, a six-coupled goods engine belonging to the Lancashire & Yorkshire Railway Company, which was fitted last autumn with an air-pump and air-heating coil on Mr. Warsop's system. The air-pump, which is single acting, is 6in. in diameter and 2ft. stroke, its piston being driven from one of the main cross-heads. This pump forces the air into a coil of 1½in. lap welded wrought-iron pipe, 61ft. long, arranged in the smoke-box, the air after traversing this coil being injected at the bottom of the boiler through a perforated pipe. It is claimed that this arrangement effects a saving by utilizing heat which would otherwise escape with the products of combustion, that it improves the evaporating power of the boiler both by increasing the circulation and by the effect of the heat carried in by the air, and finally that it prevents incrustation and priming. These are certainly important ends, but, as we have stated on former occasions, we are by no means of opinion that the injection of air into a boiler is the best way of attaining them. Let us, however, consider the results stated to have been obtained by locomotive No. 369 on the Lancashire & Yorkshire Railway. This engine, we are informed, after being fitted with the air injection, commenced working goods 'rains between Liverpool and Lowmoor on December 9, 1871, and continued this service until May 13 of the present year. Between December 9, 1871, and the 22d of April last, the distance run is reported to have been 10,987 miles, and after that distance had been performed the dome cover was taken off, and it is stated that some new tubes, which had been put in when the engine was set to work in December, were found to be quite clean and free from scale, and the firebox plates also clean. From the 22d of April to the 22d of May the engine was run without the air injection being used, and it is affirmed that in that time incrustation had set in. Of course, without full and specific information as to the precise character of the water used, the arrangements for cleaning out and other details as to practical management, it is impossible to attach to the above facts any precise value; but we are quite willing to accept them as evidence that, under certain circumstances, the injection of air has an appreciable effect in preventing the formation of scale on the heating surfaces. But we believe that it does this simply by improving the circulation, and that in proportion as the natural circulation of the boiler is efficient, so will the air injection have less and less effect. If this be true, the question then arises whether it is better to apply the air injection or to make such alterations in a boiler as will improve the natural circulation, and our own opinion is decidedly in favor of the latter course. We have, as yet, met with no evidence that the injection of air into a boiler has enabled a pound of coal to evaporate a greater quantity of water than it has been known to do in well-proportioned boilers, and so long as this evidence is wanting we should, if economy of fuel be an object, decidedly prefer employing really effective boilers to using those of an inferior kind, and improving them by air injection.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—The stockholders of the Peoria & Springfield Railroad Company met in Springfield, Ill., August 2, and elected as directors: John Williams, John T. Stuart, James C. Conkling, M. Atkin, James Haines, D. T. Thompson, S. Pulsifer, A. J. Hodges. The directors elected the following officers: President, James Haines; Vice-President, James C. Conkling; Secretary, George N. Black; Treasurer, S. Pulsifer; Attorney, R. J. Ware.

—Mr. E. A. Van Horne has been appointed General Superintendent of the Lake Ontario Shore Railroad. Mr. Van Horne has been connected with the Oswego & Syracuse and the Delaware, Lackawanna & Western railroads.

—The stockholders of the Glens Falls Railroad Company met at Glens Falls, N. Y., August 20, and elected the following directors: George H. Cramer, I. V. Baker, J. M. Warren, John A. Griswold, E. Thompson Gale, H. W. Danforth, Jr., George B. Warner, H. C. Lockwood, Charles Cramer, Thomas White, W. A. Shepard, C. W. Tillinghast, Wm. Howard Hart. Messrs. Danforth, Cramer and White are new directors, taking the places of Messrs. Thomas Dickson, of New York; S. W. Fuller and B. E. Bates; the rest of the board are re-elected. The road is leased and operated by the Rensselaer & Saratoga Company.

—We learn that Prof. De Volson Wood, long at the head of the department of engineering of the University of Michigan, has accepted an appointment as Professor of Mathematics and Mechanics in the Stevens Institute of Technology. Professor Wood is a graduate of the Troy Polytechnic Institute. Most of his life has been given to instruction, but the instinct to do engineering work as well as to give instruction in engineering is very strong in him, and he has been engaged in many practical works of various kinds, as designer, constructor, or as consulting engineer. As an instructor he has rare skill, having at once a clear idea of the subject to be taught and of the difficulties which embarrass the student. He has lately published a work on "Strength of Materials," which has added to his reputation; and he has made many original investigations and analyses of bridges and other structures. Readers of the Railroad Gazette will remember him as the author of several valuable papers in these columns.

—The recently elected officers of the Sodus Point & Southern Railroad Company are: S. K. Williams, President; R. F. Norris, Vice-President; F. A. Bassler, Treasurer; C. A. Pusey, Financial Agent; and C. E. Pomeroy, B. F. Rogers, E. Granger, E. Mather, C. Dawson, W. A. Connett, L. R. Rose, W. S. Turner, C. M. Atkins and E. Blackman, Directors.

—At the meeting of the stockholders of the Nashville & Chattanooga Railroad Company, held at Nashville, August 14, the old board of directors was re-elected, thus securing a continuance of the present management.

—Mr. J. B. Dutton has been appointed General Agent of the Central Branch, Union Pacific Railroad. Mr. Dutton was at one time connected with the Central Branch and more lately with the Hannibal & St. Joseph Company.

—At the recent annual meeting of the New Haven & Northampton Railroad at New Haven, last week, directors were chosen as follows: Joseph E. Sheffield, H. M. Welch, Stephen D. Pardee, A. L. Kidston, Matthew G. Elliott, George St. John Sheffield and George J. Brush, of New Haven; William Walter Phelps, of New York; and Charles N. Yeamans, of Westfield. The above are all re-elected with the exception of Mr. Brush, who succeeds W. W. Boardman, deceased.

—Edward A. Richardson, for the last twenty years Superintendent of the Laclede Rolling Mills, of St. Louis, has resigned to accept a similar position in the new Springfield (Ill.) Rolling Mills.

—C. V. Moulton, formerly conductor on the Chicago & Alton Railroad, has been appointed General Superintendent of the Memphis & Paducah Railroad, with headquarters at Memphis.

TRAFFIC AND EARNINGS.

—The earnings of the St. Louis, Kansas City & Northern Railway for the third week in August were: 1872, $72,350; 1871, $50,381; increase, $21,969, or 43½ per cent.

—The earnings of the St. Louis & Iron Mountain Railroad for the second week in August were: 1872, $49,323; 1871, $31,743; increase, $17,580, or 55½ per cent.

—The earnings of the Kansas Pacific Railway for the second week in August were: From passengers, $36,143.40; from freight, $53,328.29; from mails, $1,400; total, $90,871.69. Of this amount $3,491.54 was for the transportation of troops and Government freight. The earnings for the same week in 1871 were $70,021; increase, $20,850.69, or 29¾ per cent.

—The number of passenger trains dispatched from Boston daily, except Sundays, is 262, and as many arrive daily. The Old Colony sends the largest number—forty-four—and the Eastern is next with forty-two. The Boston, Hartford & Erie has the smallest number—eleven.

—The following lines of cars are reported to be now running on the Pennsylvania Railroad: Union Line, 1,700 cars; National Line, 2,500 cars; Empire Line, 500 cars; Pennsylvania Railroad and Allegheny Valley Railroad, 500 cars; Allegheny Valley Railroad and Pennsylvania Company, 1,000 cars; Allentown Line, 300 cars.

—The earnings of the Burlington, Cedar Rapids & Minnesota Railroad for the week ending August 14 were $18,150.64.

—The earnings of the Erie Railway for the week ending August 24 were: 1872, $381,070; 1871, $483,404; decrease, $102,334, or 21½ per cent. The earnings from April 1 to August 24 were: 1872, $7,442,533; 1871, $7,297,051; increase, $145,482, or 2 per cent.

—The earnings of the Grand Trunk Railway for the week ending August 10, were: 1872, £34,300; 1871, £34,800; decrease, £500, or 1½ per cent.

PERSONAL.

—Mr. Ansel Wright, Chief Engineer of the Buffalo, New York & Philadelphia Railroad, died at Port Sarnia, August 17. Mr. Wright had been suffering for some time, and at the time of his death had just started on a trip up the lakes for the benefit of his health.

—Mr. W. M. Merritt, who has for a long time been freight agent of the St. Louis, Kansas City & Northern Railway at Kansas City, having resigned his position, the other freight agents in the city held a meeting and presented an address to Mr. Merritt, expressing their esteem for him and regret at his departure.

CHICAGO RAILROAD NEWS.

Chicago, Burlington & Quincy.

The business on this road over the Dubuque line is constantly increasing, and is very satisfactory to the company.

The double track between Chicago and Aurora is now in operation to a point four miles west of Downer's Grove. There are only eight miles unfinished, and on about half of this the track is down.

Mr. J. M. Walker, the President of the company, is expected to be back from his European trip by about the 9th of September.

The business at Clinton is growing constantly in importance.

Since the putting on of the Dubuque train this company's trains, or trains that run over its road, reach the Mississippi at five different points—Dubuque, Clinton, New Boston, Burlington and Quincy—while a Burlington train also runs down to Keokuk. Only a short time ago the only point where it met the Northwestern was at Turner Junction, the old eastern terminus of the road, and it seemed altogether improbable that the two companies would ever become competitors for local traffic. Now the Burlington road or lines in its interest bid for traffic at Geneva, Rochelle, Sterling, Clinton and Dubuque.

The new Dubuque trains leave Chicago at 9:15 a. m. and 9:15 p. m., respectively, and arrive at Dubuque at 6:40 p. m. and 6:45 a. m., respectively, thus making the trip in 9½ hours. In the other direction trains leave Dubuque at 4:20 a. m. and 10:20 p. m., and reach Chicago at 2 p. m. and 7 a. m. Passengers by the night train reach Sioux City at 10:10 p. m. the next day, in 24½ hours, allowing for the difference in time. You may leave Sioux City at 7 a. m. and reach Chicago at 7 a. m. the next day.

An additional passenger train now runs between Mendota and Galesburg for the accommodation of local traffic.

Chicago & Alton.

A new turn has taken place in the business of this road. Since the new crops promise to be much above the ordinary average, farmers have pretty generally commenced to send to market the remainder of last year's crop, and the result is that this company is bringing into the city corn at the rate of 200 car loads per day, and would add another hundred car loads if there was storage room for it. The chief obstacle in the way is the lack of storage room, which will remain a difficulty until the new elevators on the South Branch are completed.

This road has now a special train for fruit, which makes the distance between St. Louis and Chicago in 16 hours—17½ miles an hour. The fruit shipments on this road are made chiefly from the vicinity of Alton, and almost exclusively to Chicago.

Lake Shore & Michigan Southern.

This company has given orders for the construction, at the North Chicago Rolling Mills, of 2,000 tons of Bessemer steel rails for the main line. This is the first steel rail made at these mills. The company will lay this all on the main line, putting the old iron rail temporarily into the side track, which will soon constitute a continuous second or double track for the road. The double track between Buffalo and Cleveland is being laid as fast as possible.

Milwaukee & St. Paul.

Track-laying is going on quite rapidly. About 22 miles have been laid southwest from Milwaukee. The company has decided to put down iron rails until the road-bed shall have become settled. The steel rails, which are being manufactured in Europe, have begun to arrive, and will be laid probably next spring; the iron being removed to other portions of the company's vast network of roads. Sometime in October is the date fixed for the arrival of the first train in this city from Milwaukee.

Chicago, Rock Island & Pacific.

This company will run commutation trains to accommodate the people who shall wish to visit the State Fair, which is to be held at Ottawa, Ill., from the 17th to the 20th of September. From the 17th to the 20th, inclusive, the fare will be 60 per cent. of the ordinary rates from Chicago, Peoria and Rock Island.

Chicago & Northwestern.

The Madison Extension from Wonowoc to Winona Junction is being pushed forward as rapidly as possible. It is estimated that the cost of the 68 miles which will lie between these two points, will be $1,500,000. The road is now finished to Wonowoc. The long tunnel, which is being excavated by Messrs. Ellis & McDowell, is quite an imposing affair. It is 3,800 feet in length, and is being opened from both ends, and work has now commenced from the bottom of two shafts. The excavation is through hard sandstone, so that curbing is unnecessary. Several steam pumps are constantly used to remove the water, which flows in from springs whose courses are traversed in the process of excavation. It is the design of the company to arrange for the passage of this water through the tunnel by means of a canal below the track. As the tunnel has a regular decline from end to end, this will be the natural method of getting along with the water. The 1,600-foot tunnel has been completed for about 200 feet each way. About 250 feet of the 1,700-foot tunnel have been excavated. It is believed that this tunnel work will all be completed by the 1st day of next January, and the track will be laid so that the road will be completed to Winona Junction very soon after the completion of the excavation.

Chicago & Pacific.

This company expect to have the bridges across the North Branch and the canal done within two weeks. A large part of the grading is done between Chicago and Elgin, and things are generally in a prosperous and pushing condition.

RAILROAD GAZETTE

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Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

CHEAP RAILROADS.

On another page will be found a letter from Mr. F. J. Cisneros, who takes exception to some of Mr. Evans' arguments reprinted in the GAZETTE of August 10. Our excuse for referring to this subject again is simply that there are still many persons who, like Mr. Cisneros, are, we believe, mistaken in their opinions and deductions on this subject. Such persons are now projecting and building narrow-gauge railroads in different parts of the country, and inasmuch as we believe all the advantages possessed by light railroads could be realized with a 4ft. 8½in. gauge quite as easily and without the inconveniences which attend a narrower gauge, we will attempt to show wherein we believe Mr. Cisneros is mistaken and also how cheap standard-gauge roads can be built.

His reply to Mr. Evans, inquiring why embankments for a 4ft. 8½in. gauge need be more than 14½in. wider than for a 3ft. 6in. gauge, is because Rankin, Vose, Gillespie, Reynault, Pendonet and Claudel say they must; and the reason 3-feet gauge roads need not be more than 10 feet wide is because somebody else says so. Now, unfortunately for this assertion and for the authorities quoted, the majority of unballasted railroads in this country are not more than 12 feet wide at their formation level, or, for the sake of greater definiteness, say at the bottom of the cross-ties. Many new roads are built even narrower than this. The embankments, for example, of the New Jersey Midland road near Hackensack average less than 10 feet wide at the bottom of the cross-ties, and the cuts in many places measure only 12 feet wide from center to center of the ditches. We may quote as another example a high embankment on the Albany & Susquehanna Railroad —*6-feet gauge*—which was only 8 feet wide, and was operated for nearly a year before it was widened. In fact, a common practice in this country when roads are first built is to make embankments very little wider than the length of cross-ties, until after the line is put in operation, when they are widened as the abrasion and settlement of the slopes may require.

Supposing, however, that with heavy rolling stock it was found necessary to make embankments 14 feet wide, it would not follow that they need be as wide for a road equipped with light rolling stock; so under any hypothesis Mr. Cisneros has not answered Mr. Evans' inquiry. The fact is, that the only object in having an embankment wider than the length of the cross ties is to guard against the washing of the earth from under them. If a road was laid on a solid wall of masonry, there would obviously be no occasion to have it wider than the ties. When, however, the latter rest on earth, which is liable to be washed and displaced by frost and heavy rains, the embankment should be made wider than the ties, so that if there is any washing the safety

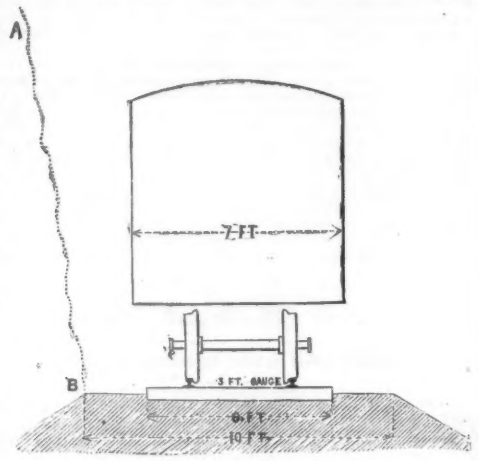

Fig. 1.

of the track will not be imperiled. On a narrow-gauge road with 6-feet ties and 10-feet embankments, there will be two feet of earth outside of the ends of the ties. If, now, this amount of earth is a sufficient safeguard against washing on one road, it is difficult to see why it will not be enough on another, and therefore why there need be any greater difference in the width of the embankments than there is in the width of gauges. The length of cross-ties we will consider hereafter, but for the present, supposing that the embankments for a 4ft. 8½in. gauge must be 1ft. 8½in. wider than for a 3-feet road, let us make a table and compare the relative quantities of material to be moved and also see how Mr. Cisneros' figures will agree with it:

Altitude of Embankments.	Areas. Gauge. 4ft. 8½in.	Gauge. 3ft.	Difference.	Percentage in favor of Narrow Gauge.	Percentage claimed by Mr. Cisneros.
1 ft.	13.21	11.5	1.71	14.87	25.8
2 ft.	29.42	26.	3.42	13.15	28.5
3 ft.	48.63	43.5	5 13	11.79	21.6
4 ft.	70.84	64.	6.84	10.68	....
5 ft.	96.05	87.5	8.55	10.	....
6 ft.	124.26	114.	10.26	9.	....
7 ft.	155.47	143.5	11.97	8.25	....
8 ft.	189.68	176.	13.68	7.75	....
9 ft.	226.89	211.5	15.39	7.25	....
10 ft.	267.1	250.	17.1	6.75	....
20 ft.	834.2	800.	34.2	4.25	....
30 ft.	1701.3	1650.	51.3	3.12	....
40 ft.	2868.4	2800.	68.4	2.5	....
50 ft.	4335.5	4250.	85.5	2.	4.49

Comment is unnecessary.

It is doubtful, however, whether even this small advantage can be justly claimed for the narrow gauge, as the length of cross-ties is determined not so much by the distance between the rails as by the weight of rolling stock, and the character of the material on which they rest. A road of the cheapest construction will, in nearly all cases, be a road without ballast, so that the cross-ties will rest in ordinary earth and will therefore require a comparatively large bearing surface to sustain the weight of rolling stock. If, now, it is found that 6-feet ties are required with any given weight of rolling stock on a 3-feet gauge, as shown in fig. 1, it is obvious that the same ties could be used with cars of the same weight on a 4ft. 8½in. gauge, as shown in fig. 2. If now the cross-ties are of the same length, the embankments may be of the same width for both gauges, and therefore no saving at all can be realized in this respect by the adoption of the narrow gauge. It is quite true that the ties for a 3-feet road might be made only five feet long, whereas it would be impossible to spike the rails of a 4ft. 8½in. gauge road to ties much shorter than six feet; but it is very doubtful whether ties as short as five feet would give sufficient stability on an unballasted 3-feet-gauge road. It must also be remembered, that in order to be able to reduce the weight of rails to the lowest limits, the ties must be placed as near together as possible, and yet leave room enough between to tamp them,

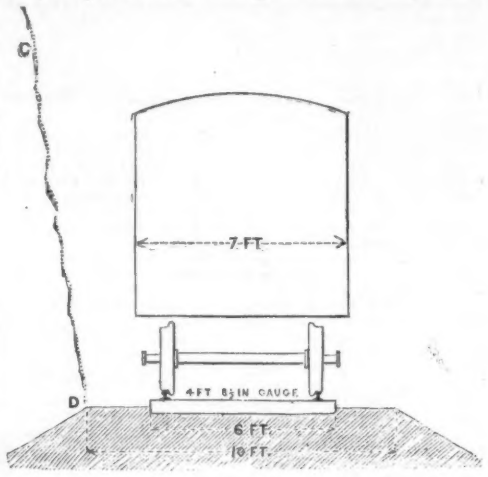

Fig. 2.

and consequently any increase in the bearing surface must be gained by increasing the length and not the width or number of ties.

It has been frequently asserted, and with much apparent plausibility, that in heavy rock cuts, either through or in the side of a hill, a great saving would result from the use of a narrow gauge. A glance at figs. 1 and 2—in which the dotted lines *A B* and *C D* are intended to indicate a rock cut—will show at a glance that the width of a rock cut is practically governed entirely, either by the width of the cars, or by the amount of room required for a ditch and road-bed. Fig. 2 represents a section of a wide-gauge road, of which the road-bed, cross-ties and cars are the same width as that shown in fig. 1, which is a 3-feet gauge. In neither is there room allowed for a ditch on the side of the road-bed. There is, nevertheless, abundant room for a car considerably wider than 7 feet. It is obviously impossible to narrow the cut for a 3-feet road, shown in fig. 1, and have room enough for the road-bed and a ditch for draining, the narrow gauge to the contrary notwithstanding.

We are therefore led to conclude that a light standard-gauge railroad can be built at the same expense for grading as a 3-feet gauge. It is claimed, we know, that shorter curves can be operated in a narrow than in a wide gauge, and therefore much grading is saved by going around hills instead of through them. In reply to this, it is only necessary to say that curves of quite as short if not shorter radius are operated on standard-gauge roads as are now in use on any narrow-gauge lines.

In setting forth the advantages of narrow-gauge roads,

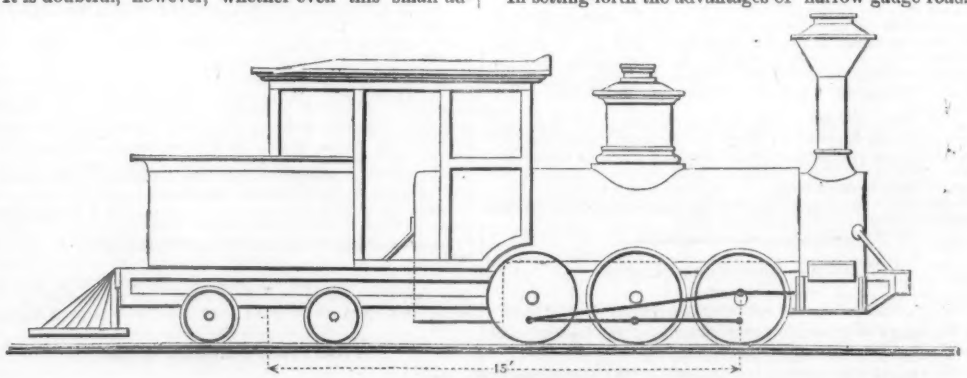

Fig. 3.

it is customary for the advocates of that system to make comparisons of the cost of *light* roads of that kind with *heavy* roads of the ordinary gauge. In doing this there is, of course, a very great apparent advantage due to the narrowness of the gauge. As our readers know, we have contended for a long time that the advantages possessed by the narrow-gauge system were due to the lightness of the equipment and the road, and their adaptation to the quantity and character of the traffic, and not to the gauge. We purpose now to make a similar comparison of the cost of construction and operation of a light and a heavy road of the ordinary gauge, and to show that if the projectors of narrow-gauge roads would instead adopt a system of light roads with light equipment, their lines would cost them no more in the first place, and their

capacity would then be susceptible of an easy and gradual increase, so that by a sort of Darwinian process of development the light road could ultimately become a first-class line, capable of doing the heaviest traffic.

As one of the largest items of expense in building a road is the cost of the rails, if we wish to cheapen the construction, one of the first things to do is to reduce the weight of rolling stock, so that lighter rails can be safely used. The strength of rails, like that of all parts of structures, must be proportioned to the maximum strain they must bear. On ordinary railroads, the driving-wheels of the locomotives carry about twice as much

	Ordinary railroad.	Light railroad.
Weight of engine and tender	100,000 lbs.	30,000 lbs.
" " cars	437,000 "	198,000 "
" " freight	460,000 "	242,000 "
Total	997,000 "	470,000 "

It will be seen that while the total weight of the light train is considerably *less* than half, the amount of freight carried is *more* than half that of the heavy one, so that there will be some saving in the amount of dead weight carried on such a road. If we adopted the system of calculation which some of the advocates of the narrow gauge invariably use, that is, compare a very light four-wheel platform car for the one road with a very heavy box car for the other, we could make a statement quite as favorable for our proposed system as they do for theirs.

The form of tank engine of which we have given an outline sketch has a much smaller amount of dead weight in proportion to its adhesion than ordinary locomotives, and therefore gives our light railroad an advantage in the comparison we have just made. The advantages of this plan of engine are quite as applicable to a heavy or a narrow-gauge road as to the light system we are describing, and therefore a portion of the economy is attributable to the plan of engine and not to the lightness of the road. We wish also as distinctly as possible to state that the cheapness of light railroads is quite as obvious when other forms of engines are used, as when that proposed is employed, and that the advantages possessed by the plan of engine, and those inherent in light roads are entirely distinct and independent of each other. Next week we will continne this subject and give some estimates of the cost of light railroads.

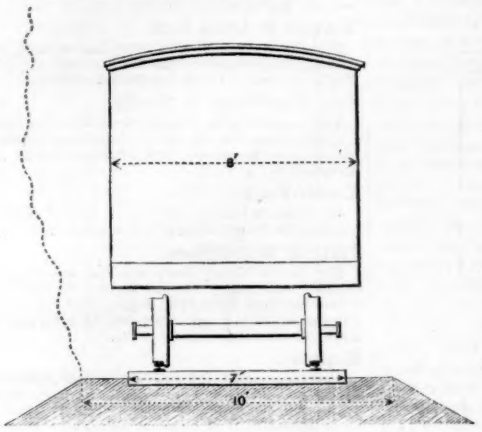

Fig. 5.

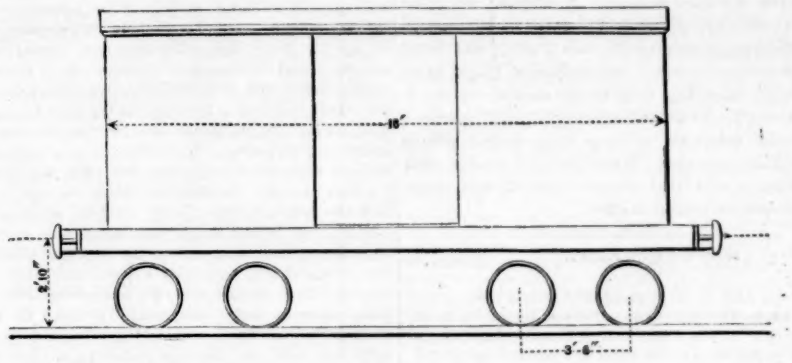

Fig. 4.

weight as the car wheels. If, now, in designing engines for a light road, we distribute the weight on the driving-wheels which is required for adhesion on more points, we obviously reduce the *maximum* strains to which the rails are subjected, and therefore can reduce their weight.

Suppose now that we should adopt an engine similar to that shown by fig. 3, with six wheels connected, and with about 3,000 lbs. weight on each wheel. We would thus have 18,000 lbs. of adhesive weight.

Suppose, also, we were to equip our road with freight cars similar to that represented by figs. 4 and 5, the inside dimensions of which would be 17x7x6ft. 2in., and whose cubical contents will therefore be 734 cubic feet, and consequently, if loaded with 15 lbs. of freight per cubic foot, would carry 11,000 lbs. of freight. Now, to run at slow speed, these cars could be built so that their weight would not exceed 8,000 lbs., so that loaded they would weigh 19,000 lbs., which would give 2,375 lbs. per wheel. Passenger cars could be made 30 feet long by 8 feet wide, with longitudinal seats, which would weigh less than 9,000 lbs. and seat 40 passengers comfortably. The total weight of car, loaded, would therefore be about 14,600 lbs., or 1,825 lbs. to each wheel.

With such an equipment, then, the maximum load on any one wheel would be 3,000 lbs. Using Rankine's rule—that is, multiplying the greatest load on any one wheel in tons (of 2,240 lbs.) by 15 to determine the weight of rail per yard, we find that rails similar to the section shown by fig. 6 would be sufficient for such loads.*

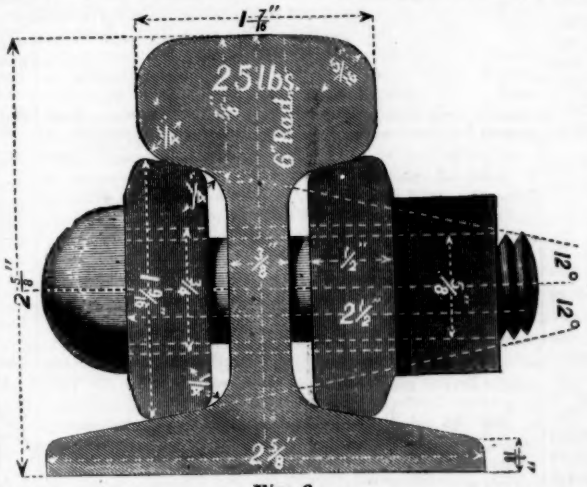

Fig. 6.

It must, however, be distinctly borne in mind that rolling stock of this kind is adapted only for slow speeds. The cars, the engines and the rails would all require to be made heavier if the rate of speed was as fast as on heavy roads, and the first cost would consequently be greatly increased.

In order to determine the capacity of such a road let us estimate the carrying capacity of an engine and train of this kind on grades of say 40 feet per mile, and at a speed of ten miles per hour.

The weight on the driving-wheels will be almost exactly 8 tons of 2,240 lbs., and the adhesion would be about 600 lbs. per ton, or a total of 4,800 lbs. The resistance of a train on a grade of 40 feet per mile will be about 23½ lbs. per ton, so that our engine would haul a train weighing about 200 tons, or about 22 loaded cars, which will carry 242,000 lbs., or nearly 120 tons, of freight. An ordinary 30-ton engine with 40,000 lbs. adhesive weight will take a train of 23 loaded box cars, which weigh from 18,000 to 19,000 lbs. each and carry 20,000 lbs. of ordinary freight. The total weight and carrying capacity of the two trains will therefore be as follows:

* We know Rankine's rule was prepared before the later and more improved rail sections were designed, and for heavy traffic would require heavier rails than are necessary; but for lighter sections it agrees very nearly with Sandberg's tables, which have been calculated for his improved rail section.

"RAILROAD REFORM."

An extraordinary article appeared in the New York *Evening Post* of the 27th of August, which suggested a revolution in the charges for railroad transportation upon a singularly unjust basis. It is true that the proposition has been made before in England, but its injustice and impracticability are as much greater in the United States as this country is greater in extent than Great Britain.

The plan is to have a single rate for the transportation of a passenger or a ton of freight, without regard to distance, just as there is a single rate for postage on letters, whether they go from New York to Harlem, or from Eastport to San Francisco. The writer reasons that if we divide the total freight receipts of all the railroads of the country by the total number of tons carried, and make the quotient the standard rate for all distances, the receipts would be just as great as they are now; and so with passengers. After discussing the application of the plan to some foreign countries, the writer says:

"To carry out such a plan here, it is, as has already been stated, alleged that the railways have only to extend their post office practice to their work on their own account. The English carry 130 millions of parcels annually of less than 2 pounds weight. We should carry as many at least, and four times that number above 2 and under 1,000 pounds. These, at rates varying from 10 cents to a dollar and averaging possibly 40 to 50 cents, would bring in 200 to 250 millions of dollars. 100 million passengers, our present number, at 12, 25 and 50 cents, limiting the 12 under 3 miles and the 25 to under 10, and charging 1 dollar for all distances over 100 miles, would produce 40 millions, while our 100 million tons of freight, at 1 to 5 dollars a ton for all distances, would bring in as much as at present, namely, 250 millions. Adding 50 millions for live stock and miscellaneous receipts, the total income could easily thus be made up to 550 millions, or 100 millions in excess of present earnings. Taking into account, however, the increase of passengers and tonnage sure to follow from the adoption of such a plan, a much greater increase might be expected."

He seems to have recoiled from carrying out the principle fully, and has thus admitted a few variations in rates according to distances.

Now it ought not to be necessary to point out the gross injustice and the utter impracticability of such a plan, in any district larger than a township at least. It never could be considered seriously by any one who had the slightest conception of working expenses and the difference between gross and net earnings. If we equalize charges in this way it is evident that we must *increase* the rates for short distances (which include many times the greater share of the traffic), and that, therefore, there will be a discrimination against the short and in favor of the long traffic—a discrimination which would revolutionize industries in many parts of the country. No attempt to show the justice of the equal charges is made, as certainly none could be made successfully. The cost of transportation does not vary exactly as the distance, it is true; but with anything but the smallest parcels—like letters, for instance—the proportion of the non-variable expense, included in what may be called terminal expenses, is very small, and of course grows smaller with the distance. Even with short distances this difference is marked, as any one may see by considering city express expenses and charges. The express man who takes your trunk from one hotel to another a block distant, in New York, must load and unload it with as much expenditure of time and effort as if he took it from the Battery to Central Park; yet no one would think of asking him to do the latter service as cheaply as the former. With railroads the difference is greater, as the proportions between distances are greater. Between Chicago and New York the cost of loading and unloading, billing, collecting, etc., is probably less than 2 per cent. The comparison with postal charges is entirely fallacious. In the first place, the cost of carrying letters even *does* vary with the distance, and is probably twice as great between New York and San Francisco as between New York and Boston; but the difference even then is insignificant in amount, and any variation would of itself increase expenses. In the next place, and chiefly, the cost of *carrying* the letter is but a small proportion of all the expenses connected with it, which are largely independent of the distance or the weight. The same fallacy attends the package transportation. It costs no more to handle a package of two pounds than one of four ounces; and the cost is chiefly for handling, the transportation being a small matter. That is, with small parcels and those of trifling weight the fixed charges are a large and the variable a small proportion. One car can carry letters enough to earn $20,000 in a single trip, if they are packed close enough; but you can have a car-load of first-class freight taken from New York to Chicago for $150.

As to the effect of such a system of charges on the earnings of the railroads and their traffic, perhaps it would not be at all unfavorable if there were no such thing as working expenses. Doubtless the long traffic would be immensely increased. Indeed, when the fare from Portland to San Francisco is one dollar, we believe that every man, woman and child able to travel will be likely to cross the continent at least once a year, and we should have probably 40,000,000 of through fares yearly on the Pacific Railroad. Let us be moderate, and put it at 100,000 per day. These will crowd 2,000 cars—which will cost something for wear and tear and interest—and not less than 250 locomotives, and will wear out about three sets of new rails yearly, at least with the additional freight traffic. But it is unnecessary to go into details. The average hauls being increased in length—multiplied would be more correct—the expenses would increase in something like geometrical progression with the traffic, and with ten times the present earnings the companies might have an annual deficit exceeding their entire capital.

When next we have railroad reform proposed, it would be well for the reformer to learn that there is such a thing as working expenses; that these vary nearly with the traffic mileage, and that charges should bear some proportion to cost of transportation.

New Freight Rates.

At a recent meeting of Western general freight agents, held in Toledo, divisions were agreed upon for east-bound grain and fourth-class freight to New York, Boston, Philadelphia and Baltimore, based on the rates of 50 cents per hundred from Chicago to New York. The rates to New York are as follows:

	Cents.		Cents.		Cents.
Alton, Ill.	61	Edwardsville, Ill.	65	Naples, Ill.	65
Altamont, Ill.	65	Effingham, Ill.	05	Odin, Ill.	65
Arcola, Ill.	65	El Paso, Ill.	61	Pana, Ill.	65
Ashley, Ill.	70	Fort Wayne, Ind.	45	Peru, Ind.	50
Bloomington, Ill.	65	Flora, Ill.	65	Peoria, Ill.	60
Belleville, Ill.	65	Farmer City, Ill.	65	Pekin, Ill.	60
Burlington, Iowa.	65	Ferris, Ill.	68	Paxton, Ill.	65
Beardstown, Ill.	65	Gibson, Ill.	65	Quincy, Ill.	65
Cincinnati, O.	47½	Gilman, Ill.	59	Shawneetown, Ill.	62½
Crawfordsville, Ind.	55	Hannibal, Mo.	70	Sandoval, Ill.	65
Colfax, Ind.	55	Indianapolis, Ind	50	Springfield, Ill.	65
Chicago, Ill.	50	Jeffersonville, Ind.	65	St. Louis, Mo.	65
Cairo, Ill.	65	Jacksonville, Ill.	65	Toledo, O.	40
Champaign, Ill.	65	Keokuk, Iowa	65	Tolono, Ill.	65
Camp Point, Ill.	68	Lanesville	57½	Terre Haute, Ind.	57
Carthage, Ill.	68	Lafayette, Ind.	50	Taylorsville, Ill.	65
Clinton, Ill.	65	Logansport, Ind.	50	Urbana, Ill.	65
Decatur, Ill.	65	Louisiana, Mo.	70	Vincennes, Ind.	55
Danville, Ill.	55	Madison, Ind.	55	Vandalia, Ill.	65
Edgewood, Ill.	70	Mattoon, Ill.	65	Virginia, Ill.	65
Evansville, Ind.	60	Mt. Pulaski, Ill.	65		

These rates go into effect on the 1st of September. By them the freight on a bushel of corn from Chicago to New York will be 28 cents, and on wheat the rates per bushel will be: from Chicago and Indianapolis, 30 cents; St. Louis, Quincy, Keokuk, Burlington, Springfield, Bloomington and Cairo, 39 cents; Evansville, Peoria and Pekin, 36 cents; Fort Wayne, 27 cents; Cincinnati, 28½ cents; Toledo, 24 cents.

At these rates a considerable proportion of the grain, especially from interior points, will take the all-rail route in preference to the route by rail, lake and canal.

Record of Track Increase.

The following additions to the mileage of the country are chronicled in this number of the RAILROAD GAZETTE:

Central Pacific—Visalia Division, extended from the recent terminus at Fresno southward to Tipton, Cal., 58 miles. *Atchison & Nebraska*, extended from Sterling northwest to Saltillo, Neb., 27 miles. *Montrose* (narrow-gauge) 4½ miles of track laid from Tunkhannock, Pa., northward. *Kansas Central* (narrow-gauge), extended to Holton, Kan., 5 miles, and 50 miles from Leavenworth. *St. Joseph & Denver City*, extended from Alexandria, Neb., west by north 58 miles, to a point within 37½ of Kearney. *Paris & Danville*, completed by an extension from the Little Vermillion north to Danville, Ill., about 10 miles. *Worcester & Somerset* opened for traffic August 12 from Newtown, Md., northwestward to a junction with the Eastern Shore Railroad, about 7 miles. *Hastings & Dakota*, extended from Young America westward 13 miles to Glencoe, Minn. *Maryland & Delaware*, completed by the extension from Easton southwest to Oxford, Md., 10 miles. *Sodus Point & Southern*, extended from Sodus Center northeastward to the northern terminus at Sodus Point, about 6 miles. *Newark & Hudson*, completed from Newark east 5 miles to the westward of the Bergen tunnel, N. J., operated by the Erie. *Missouri, Kansas & Texas—Cherokee Division*, extended from McAllister southwestward to Atoka, Ind. T., 64 miles. *Northern Pacific*, extended from the last winter's terminus at Morehead, westward about 40 miles.

This is a total of 307½ miles of new road.

The Advantages of Education.

The following extract from a lecture delivered to the Telegraph Staff of the Postal Telegraph Department of Great Britain by Mr. William Henry Preece, member of the Institute of Civil Engineers, we commend to the consideration of railroad managers and others who are called upon to select assistants, and also to all of that class who pride themselves as being "practical" men, and who sneer at all theoretical knowledge of which they are ignorant:

"The object of education is to attain precision of thought, and to possess the power of drawing correct inferences from facts—indeed, to exercise judgment and common sense. There is no better method of acquiring these valuable qualities than by a scientific training. We can find out many things without scientific training—trace faults, &c.; but we can do such things more quickly, more correctly and with more gratification with such training. Rule of thumb methods have always a flavor of science in them; and though it has been said that an ounce of practice is worth a ton of theory, an ounce of practice *with* theory is worth a ton of practice without theory."

ARKANSAS, if a New York *Tribune* correspondent may be trusted, has shown the most brilliant example of railroad "financiering" yet displayed in connection with State subscriptions and guarantees: which is saying a great deal, for a great many millions have found their way into the pockets of "enterprising" railroad men who have taken upon themselves the burden of "developing the resources" of the Sunny South since the war. The story is that a gentleman influential in politics was patriotically inclined to develop the wealth of certain Southern counties through which the road-bed for a railroad had been graded before the war. Securing a title to this road-bed, the State Legislature was induced to vote the company $10,000 per mile, payable as fast as sections of ten miles should be ironed, besides a land grant of something like a quarter of a million of acres. Now this patriotic and ingenious developer of the State's resources (above all, ingenious) proceeded in his work of developing on an extraordinarily economical plan—doubtless reasoning that the more he might have left from the subsidy, the better he could "develop resources" elsewhere and thereafter. So he bought iron enough to lay ten miles of track and drew his $100,000. Now, see what financial "genius" can do. Instead of buying ten miles more of iron, like the ordinary, slow-going, plodding manager, he simply sent his iron car back to the first station, took up the rails, carried them to the other end of his ten-mile section, and thus very soon and with very little expense had a new ten miles, on which he drew another $100,000, and so on to the end of the road, when he had "completed" 120 miles of road, drawn $1,200,000 of State bonds and had ten miles of iron for sale, whose value, unfortunately, was depreciated by the fact that none of it was nearer than 110 miles to a railroad or navigable stream. The only weak point in this brilliant management seems to have been the choice of so short a line. If only he had taken in hand the North & South Pole Railroad, or even the Alaska & Florida, his genius might have had an adequate reward. Meanwhile, in these days of high prices for iron, managers will bear in mind that no economy has ever shown so great a saving as this.

"CONSCIENCE doth make cowards of us all," says the poet; but sometimes it seems to make us brave enough to face shame and repair a wrong. Not unfrequently we hear of some anonymous contribution to the United States Treasury, accompanied by a confession that the Government had been defrauded of the amount, and that the delinquent desired to right his wrong and clear his conscience as far as possible. Elsewhere we publish a copy of a letter sent to Mr. Samuel Powell, General Ticket Agent of the Chicago, Burlington & Quincy Railroad, which is a similar case of conscience. We have never, however, before heard of such a reparation to a railroad company. Indeed, many seem incapable of considering a corporation as having rights which it is their *duty* to consider. Most men who pretend to be honest probably call attention to an error on the part of their grocer or other merchant by which he would fail to collect his just dues; but if the number of these who would not call the conductor's attention when he had chanced to omit collecting their fares, and insist on paying, could be known, we fear it would have a very depressing effect on advocates of a lofty morality.

The person who made a remittance to Mr. Powell, however, says that he "obtained a ride under wrong pretenses." If he should be imitated by all those who have done the same, Mr. Powell will perhaps need an additional clerk. Will the gentleman who "would be so much obliged for a pass" for his wife to Burlington, or any other place, and who gave the pass to his wife's friend instead, and intended to when he asked for it, remit the price of a ticket? And will the "gentlemanly editor," who, rarely traveling on that line himself, loaned his complimentary annual to his friend the insurance agent, who travels most of the time—will he or the insurance agent (to ease both consciences both should) count out the price of forty or fifty or a hundred tickets? If all do, this "little leaven" must be extraordinarily powerful, for the "whole lump" is a shockingly big—and hard—one.

FAST TIME has been the subject of comment in sundry newspapers recently, and illustrations of the great speed now prevalent on American railroads are freely given, without the slightest attention to the facts in the case. Thus the *Iron Age* says that "you can now go from Cincinnati to Louisville in about three hours," whereas the time of the fastest train lacks but ten minutes of four hours, and the speed is about 33 miles an hour. Between New York and New Haven, 74 miles, it says "you are now put through in 1¾ hours." The fastest train makes the distance in *two* hours and forty minutes, and the speed is thus 28 miles instead of 42 miles an hour. So the time from New York to Boston, 234 miles, is not 5½ hours, as the *Iron Age* has it, but 8 hours 5 minutes, and the speed is only 29 miles, not 42 miles an hour. And the statement concerning the New York and Washington express is equally mistaken. The fastest train makes the distance, 228 miles, in 8 hours 20 minutes, not 5 hours 30 minutes.

The statements concerning the long routes are just as far from the truth, and, indeed, the writer must have magnified like a microscope every speed in the same proportion, or else looked at the time through the wrong end of a telescope. He says that travelers go to Chicago, 835 miles, in 20 hours, and to St. Louis, 1,000 miles, in 24 hours. Now, in the first place, the shortest route to Chicago is 899 miles, and the shortest to St. Louis 1,063 miles. The shortest time between Chicago and New York is, we believe, 33 hours instead of 30, and between St. Louis and New York 42 hours, instead of 24.

OLD AND NEW ROADS.

A Wooden Railroad in Michigan.

A correspondent of the Detroit *Tribune*, writing from Grand Junction, Mich., says:

"The horse railroad of Mr. Samuel Rogers is being rapidly completed. The length is about 2¼ miles. It runs through woods the entire length, except at the junction. Mr. Rogers has about 7,000 acres of timber lands lying in four towns to the north and east of this place. Part of the land comes up to the railroad here and north. The road is designed to aid him in getting his timber to market. He has graded the whole line as well as the usual grade of railroads, ties it every four feet, lays on a wooden rail 4x5, dovetailed and keyed to the tie, and all at an expense of less than $1,000 per mile, including the equipment. The horses will walk on the track tandem, and will draw 3,000 feet to a load. The cost to deliver the lumber from the mills would be $3 per thousand. Mr. Rogers estimates the cost by his road at 80 cents per thousand. One-half mile out on the line are skid works, for loading logs to take back to the mills."

Memphis & Little Rock.

The Secretary of the Treasury has ordered the customs officers at Memphis, to restore the iron belonging to this company, which was seized for non-payment of duties.

Gulf, West Texas & Pacific.

This road is to be completed to Cuero by October 1, but it is probable that the Northern Branch to Gonzales and Rockport will not be commenced until the main line is completed to San Antonio.

Kansas Pacific.

Mr. Francis Gallup, of Denver, has a contract for grading 20 miles of the branch from Kit Carson to Fort Lyon.

Texas & New Orleans.

The Neches Valley *News* says that the sale of this road will certainly take place on the second Tuesday in October. This is the line from Houston, Texas, east to the Sabine River, 41 miles of which is in operation, the 64 miles east of Liberty having been abandoned many years.

Montrose.

A correspondent informs us that 4½ miles of track is laid on this new narrow-gauge railroad, and that the entire line from Tunkhannock north to Montrose, Pa., 27½ miles, it is expected to complete by the close of the year. Montrose is about 20 miles due south of Binghamton, New York, and the line of the road is just about parallel with and seven or eight miles west of the Delaware, Lackawanna & Western.

Newport & Brattleboro.

Application will be made to the Legislature of Vermont at its next session for a charter for a continuous line of railroad through the center of the State, from Newport on the north, through Montpelier, Chelsea, Woodstock and Cavendish, to Brattleboro on the south.

Piedmont & Potomac.

The Washington *Patriot* says that Colonel Isaac D. Budd, Superintendent of this road, has a corps of engineers at work in the Blue Ridge Mountains, who are making a careful survey and examination of Thornton's Gap, Beahm's Gap, Milan's Gap, Brown's Gap and Swift Run Gap, with a view of ascertaining the most practicable and feasible point of passing the ridge from the east to the Page Valley country. It is proposed by the company, if possible, to reduce the grade, going east, thirty feet to the mile, which accounts for the careful surveying and thorough engineering which has been made. A tunnel nearly a mile in length will have to be constructed, and the nature to the road is such that a heavy expenditure will be required. If is estimated that the cost will be nearly $6,000,000.

Milwaukee & Fond du Lac.

Messrs. De Graff & Co., the contractors, have commenced operations on this road in the city of Milwaukee. A large force of men is to be put on and work pushed ahead as fast as possible.

Plymouth, Kankakee & Pacific.

The Hennepin *Record*, of recent date, says: "Mr. T. J. Nicholl, Chief Engineer of the Plymouth, Kankakee & Pacific Railroad, left here last Thursday morning for Plymouth, Ind., the eastern terminus of the road. He informed us that it is the intention to immediately commence work on the road at that point, and get ten miles ready for the iron by the time Mr. Barnes returns from Europe, so that he can commence laying the track."

Peoria & Springfield.

Advices from Springfield say that the contracts for the earthwork from Pekin south to Mason City, Ill., 25 miles, will be let by September 15. Iron is being laid between Peoria and Pekin.

New Orleans Railroads.

The New Orleans *Picayune*, of August 18, says:

"In another column will be found a telegram from the special committee of the Railroad Committee of Fifty, appointed to confer with the Mobile & Texas Railroad Company concerning the prospects for an early completion of the branch road to Shreveport.

"The information that the Houston road is to be pushed on immediately will be grateful news to our people. It is perhaps not well known that the agreement with Mr. Morgan has been canceled some time, and of late the work has been entirely suspended.

"With regard to the branch road from Vermilionville to Shreveport, the committee proposes to get possession of the $2,000,000 issued by the State as a subscription to its stock, and adding to it the subscription of $500,000 made by Shreveport make up, together with a small subscription in New Orleans, a sufficient fund to build the road. The bonds are worth, perhaps, $1,500,000; so that the sum of $2,000,000 in cash is already secured (for it is beyond doubt the $500,000 subscription of Shreveport, though given nominally to the Back Bone Railroad, we believe, will be transferred to the new concern).

"It will not cost more than $3,000,000 to build the road from Shreveport to Vermilionville, so that New Orleans can now get rail connection with Red River Valley by subscribing $1,000,000 or perhaps $750,000.

"It is furthermore the intention of the committee to supervise the expenditure of this fund themselves, so that there will be no possibility of its being perverted from the purposes for which it was raised."

New Mail Routes.

The Postmaster-General has authorized the extension of the mail service on the Cleveland, Columbus & Cincinnati Railway, from Dayton to Cincinnati, 56 miles—the rate not yet fixed. Also on the Lake Shore & Michigan Southern Railway, from Jonesville to Albion, Mich., 23 miles. An extension of the mail service is also authorized on the Chicago, Clinton & Dubuque Railroad, from Dubuque to Clinton, Iowa.

Missouri, Iowa & Nebraska.

Mr. F. M. Drake, the President, whose office is at Centerville, Iowa, informs us that the road is now under contract from Lancaster, Mo., the present western terminus, west by north to Centerville, 29 miles, with a large force grading and the track following. The company expects to complete the road to Cen-

terville in November, and the present intention is to reach Corydon, Iowa, 25 miles west of Centerville, this year; and if this is done the contract for this section must be let by the middle of September.

The part of the road in operation is from Alexandria, Mo., on the Mississippi five miles below Keokuk, Iowa, westward to Lancaster, 61 miles. A very few miles west of Lancaster the road will cross the St. Louis, Kansas City & Northern.

Perth Amboy & Bound Brook.

The Perth Amboy *Democrat* says: "The exorbitant prices asked by owners of lands through which the Bound Brook Railroad has been projected has had the effect to suspend operations in Perth Amboy, and to take the engineering corps off in another direction. A new survey was ordered by Judge Packer last week, and property on the Sound, above Woodbridge, quite available for the purpose of coal docks, has been offered the company at much less prices than are demanded here."

Sodus Point & Southern.

The section between Newark and Sodus Point, 15 miles, is now completed and in operation, and the company is constructing wharves and coal packets at the harbor.

Paris & Danville.

This road was completed August 20. Regular trains are to begin running about September 1. The road forms virtually an extension of the Chicago, Danville & Vincennes road from Danville south to Paris, Ill., about 35 miles, though, we believe, there is no connection between the two companies.

Central of New Jersey.

A large force is at work on the second track on the Lehigh & Susquehanna Division. The section from Allentown to Easton will be complete in about two months.

Houghton & Ontonagon.

A force of 1,000 men is employed on this road, and the work is progressing west, from the foot of Lake Michigammi and east from the end of the ten-mile section completed from L'Anse.

Fort Wayne, Jackson & Saginaw.

A sink hole, near Angola, swallowed up a part of the track near Angola, August 17. Trains were more or less delayed for a day, passengers being transferred around the break.

Delaware, Lackawanna & Western.

Thirty-five thousand baskets, or about 70 car-loads, of peaches were brought to New York over the Morris & Essex Division, August 22. This is very much the largest quantity ever hauled over the road in one day.

Worcester & Somerset.

Regular passenger and freight trains commenced running over this road from Newtown, Md., to the junction with the Eastern Shore Railroad, August 12. Two trains are run each way daily. The principal articles transported at present are peaches and other fruit.

Philadelphia & Reading.

The Philadelphia *Ledger* says: "Arrangements have been made between the lines interested for the sale of through tickets to and from New York, and the principal points on New York Division of Pennsylvania Railroad, and Philadelphia, Ninth and Green, Columbia Avenue, Germantown, Chestnut Hill, Manayunk, Conshohocken, Norristown, Phœnixville and Pottstown stations of Philadelphia & Reading Railroad and branches, *via* Intersection station of Germantown & Norristown Branch of the latter line. The great amount of business transferred at the Intersection has necessitated the stoppage of nearly every train between Philadelphia and New York. By this arrangement through tickets can be purchased at the above-mentioned stations, and the necessity of purchasing two tickets is avoided."

Missouri, Kansas & Texas.

This company has recently established an office in Chicago for freight, passengers and the sale of its lands. Mr. D. R. Williams is General Agent; Mr. J. H. Mountain, Northern Passenger Agent, and Mr. S. A. Danforth, Land Agent, and their office is in the building at the southwest corner of Dearborn and Washington streets.

The Fort Scott *Monitor* says that the Judge of the Vernon County (Mo.) Circuit Court has issued an injunction prohibiting the County Treasurer from paying the interest on the bonds issued to this company until the Court decides whether the company has kept its contracts or not. Henry County, Mo., is about to apply for a similar legal proceeding.

Atlantic & Pacific.

A telegram from San Francisco dated August 27 says:

"The Executive Committee of the People's Committee of One Hundred has rejected the proposition to compromise the controversy with the Central Pacific Railroad Company, by giving the latter a subsidy to build the Ravenswood bridge on condition of the abandonment of the Goat Island project. The committee recommended instead the construction of a new road between San Francisco and the Mississippi valley in competition with the Central Pacific.

"Over 2,000 citizens have subscribed an aggregate of more than $1,500,000 toward the capital stock of the proposed Atlantic & Pacific Railroad from St. Louis to San Francisco, via the 35th parallel. This popular subscription foreshadows the success of an application to the city for a loan of $10,000,000 in bonds to the same company, in return for its equivalent in preferred stock, by vote of the people at the November election.

"The San Francisco & Colorado Company, a rival to both the Central Pacific and the Atlantic & Pacific companies, also applied to the Board of Supervisors last night for aid to the extent of $10,000,000 of absolute subsidy, without return in bonds or stock."

Wisconsin Central.

A statement recently made concerning the contracts of this company, and the dates at which sections are to be completed, was in some respects incorrect. The following is an official statement of the condition of property:

There is completed and in operation for regular business 65 miles (Neenah and Menasha to Stevens' Point). Construction trains are running 30 miles beyond Stevens' Point. On the Lake Superior end, from Ashland south into Iron Range, 30 miles is to be completed in November. Sections are under contract to be completed at the dates following: September 1, ten miles; September 15, twenty miles; November 15, twenty miles; December 1, twenty miles; June 1, 1873, twenty miles; July 1, twenty miles; October 1, 1873, twenty miles. This makes a total of 255 miles, forming the line of the Wisconsin Central as originally planned. It has leased the Milwaukee, Lake Shore & Western Railroad, which will extend from Appleton eastward to Manitowoc, and south along the lake shore to Milwaukee, with a spur from Manitowoc north to Two Rivers, 130 miles, a large part of which is now completed. There remains to be put under contract the five miles from Menasha to Appleton. Thus the company will have in operation before the close of next year 390 miles of road.

Union Pacific.

A telegram from Cincinnati dated August 27 says:

"The Government directors in the Union Pacific Railroad Company having returned from their tour of inspection, express themselves pleased with the condition of the road, its equipment, etc. The preparations for the coming winter are expected to prevent any renewal of the snow blockade. Additional laboring forces have been provided, and sheds erected wherever snow troubles are likely to occur. The Government directors also express their confidence that with proper management the road is capable of doing business enough to meet the mortgages of the company and provide for the liquidation of the advances made by the Government. They say that the country tributary to the road is developing rapidly, and everything promises well for the future, if some existing abuses can be removed and strict business management for the interest of the corporation is enforced."

Intercolonial.

The Commissioners advertise for ties for the Mirimichi section of this road, from Moncton to the northwest branch of the Mirimichi River, 156 miles, about one-fourth to be delivered by October 1, and the rest by next July. The specifications are for tamarac, princess pine, hemlock or cedar, and not more than 15 per cent. cedar.

St. Louis, Kansas City & Northern.

The company has been receiving proposals for the construction of the road-bed for a track for an extension of the Kansas City Division of this road from its present terminus at Minaville, Mo., where it forms a junction with the Kansas City Branch of the Hannibal & St. Joseph Railroad, to the east end of the approach of the Kansas City Bridge, about eight miles. The company's trains now run over the Hannibal & St. Joseph track.

Richmond & York River.

This road, which extends from Richmond, Va., eastward to West Point, 38½ miles, was advertised to be sold on August 14, under an old deed of trust, but the sale was delayed by an injunction. If the injunction is dismissed, and the sale made, it is thought that representatives of the Pennsylvania and of the Chesapeake & Ohio will be bidders.

Philadelphia & Reading.

The stockholders of this company are notified that between September 10 and October 1, they will be entitled to subscribe at par to the company's new convertible loan at the rate of 30 per cent of their holdings registered September 4. The payments are to be made 15 per cent on subscribing, 15 per cent. January 15, 1873, and 10 per cent. on the 15th of each of the following months: April and July, 1873; January, April and July, 1874; January and July, 1875. The bonds will be dated January 1, 1873, will bear 7 per cent. interest, and be convertible into stock at par at any time after July 1, 1876, and January 1, 1892. The privilege of subscribing may be transferred.

Indianapolis, Bloomington & Western.

This company is offering its first-mortgage 7 per cent. gold bonds, on its extension of 217 miles, at 90. The line is to extend from Urbana, Ill., nearly due west through Clinton, Lincoln, Mason City and Havana to Warsaw, Ill., where it is to connect with the Missouri, Iowa & Nebraska Railroad for Brownsville, Neb. The agents advertise that 60 miles of the extension is completed and 110 graded, and that the whole will be completed early in 1873. It will cross no less than fourteen railroad lines.

Mississippi Valley & Western.

The people of Hannibal, Mo., voted, August 20, against the proposition to subscribe $75,000 to aid in the extension of this road. It is said that a rival company announced its purpose to build the road without any subscription.

Keokuk & Centerville.

There is some talk of building a railroad from Rock River, Iowa, on the Des Moines Valley road, about 40 miles from Keokuk, west through Keosauqua, Troy and Bloomfield to Centerville, to be extended eventually through the southern tier of counties to the State line. The road would intersect the St. Louis, Kansas City & Northern and the Burlington & Southwestern at Bloomfield, and the Chicago & Southwestern and the Missouri, Iowa & Nebraska roads at Centerville. Such a road would be very close to the Burlington & Southwestern, varying from nine miles distant at Keosauqua to an intersection at Bloomfield, while from Bloomfield to Centerville it would not be more than four or five miles distant from the Chicago & Southwestern, and, for much of that distance, even closer to the St. Louis, Kansas City & Northern line.

Atlantic & Pacific.

The new offices of this company at St. Louis have lately been occupied. The building, which is large and convenient, is situated at the corner of Walnut and Fourth streets, and contains on the first floor the offices of the President, Purchasing Agent, General Freight Agent and Land Agent; on the second floor the rooms of the General Superintendent and his Assistant, with the telegraph department and the Cashier's and Paymaster's offices; the third floor contains the offices of the Chief Engineer, Auditor and General Ticket Agent. The rooms are large and well lighted, and the building well adapted to the purpose for which it is used.

Maryland & Delaware.

This road is now in successful operation from Clayton, Del., southwest 54 miles to Chesapeake Bay at Oxford, Md., the extension from Easton to Oxford, ten miles, being completed.

Southern Maryland.

The grading between Mechanicsville, in St. Mary's County, and Patuxent City, in Charles, is nearly completed, and work is progressing rapidly.

Baltimore & Ohio.

Some time ago this company offered to increase their shops at Wheeling, W. Va., and erect new buildings to the amount of $100,000, provided they could be exempted from past, present and future taxation. This was refused, and the company has now resolved to remove the shops to Bellaire, O.

Hanover Branch & Susquehanna.

The surveys of this road are progressing; the first line is nearly finished, but two or three other lines will be run.

Elk & McKean.

The name of this company has been changed to the Buffalo, Pittsburgh & Rochester Railroad Company.

Cumberland Valley.

The last span of the bridge across the Potomac at Williamsport, on the extension of this road to Martinsburg, W. Va., has just been put down. The length of the bridge from abutment to abutment is 1,018 feet. It is to be braced with arches from pier to pier, weather-boarded outside, and to have a sheet-iron roof. It is still uncertain when the road will be opened.

Marshall & Coldwater.

Mr. H. V. Libhart writes to the Marshall (Mich.) *Statesman*, that the contracts are all let and work going on on the whole length of the line from Coldwater, Branch County, through Calhoun, Eaton and Ionia counties to Elm Hall, in Gratiot County, a distance of about 120 miles. Mr. Green, the President of the company, says that the Pennsylvania Company have agreed verbally to iron, equip and operate the road, though no written contract has yet been made.

Pacific, of Missouri.

Mr. J. Pitzman, County Surveyor of St. Louis County, has made an elaborate report concerning the street crossings over this road in St. Louis. The report is made to a committee appointed to take action in the matter by a recent meeting of property-holders. After carefully considering the question of carrying the different streets on bridges over the railroad at its present grade, the report pronounces strongly against that method of meeting the difficulty, both on account of the cost and the high grades required in the streets. It is recommended that the grade of the railroad be lowered 12 feet, from Tayon avenue to the depot, when the street bridges can be easily constructed. The railroad company has so far taken no action in the matter, and it is possible that it may object very strongly to the proposed plan.

Frederick & Pennsylvania Line.

The Baltimore *American* says of this road:

"Work on the Frederick & Pennsylvania Line Railroad is being pushed rapidly toward completion. The track-layers on the north end are past Watersville, while the track is also being put down from the south, or Frederick end, and is laid across the Frederick & Woodsboro' pike. Thus the track is being laid from both ends, and the pike is lined with heavy ties from the mountains along the entire line. The iron bridge over the Monocacy is finished, and is a magnificent structure. In twenty working days, President Loats informs your correspondent, the road will be completed to Frederick city; and he says he has good reason to know the tonnage over it will be heavy. Already is coal shipped along its line and distributed at the different stations."

New Haven & Northampton.

At the annual meeting of the stockholders of this company, at New Haven lately, the annual report was read. The total receipts during the past financial year were $660,060, of which $439,937 was from freight, $177,554 from passengers, $12,398 from express, $12,318 from hoisting engines and $7,887 from mails. The total operating expenses are $415,430, leaving $244,629 as the net earnings. Deducting the amount paid for taxes and interest, a balance of $111,112 remains. The annual meetings of the company will hereafter be held in the second week in January.

Massachusetts Central.

Mr. Stone, President of this company, is authority for the statement that the contract for completing the road extends to November, 1873, and that the recent advance in iron will cause a delay in buying the rails and other iron necessary for the construction of the road. No entrance into Boston has as yet been decided upon.

Texas & Pacific.

A large meeting was held at San Francisco, August 22, in behalf of this road. The meeting was addressed by Colonels Thomas A. Scott, Williamson and Forney, Senator Sherman and Governor Throckmorton.

St. Louis Narrow-Gauge.

Work was commenced on this road, August 19, at a point on Union avenue, north of Forest Park, in St. Louis. The grading of eight and one-third miles has been put under contract, to be completed in four months. The whole length of the road will be 25 miles, and it is intended for suburban traffic entirely.

Minnesota & Northwestern.

The St. Paul *Press*, of August 17, says that the Iowa Central Railroad Company has offered to take this partly finished road (from Wells to Mankato), complete it by January 1, 1873, and maintain it for ten years, provided the people of Mankato will revote the lapsed subsidy of $65,000. An election has been called at Mankato for September 10.

Hastings & Dakota.

The Winona *Republican*, of August 21, says that this road will be in operation as far as Glencoe by September 1. Glencoe is about 13 miles west of Young America, the present terminus.

Ohio & Kentucky.

Lancaster and Hocking townships, Ohio, voted August 19 to expend $80,000 for this road, under the Boesel law.

Wheeling & Lake Erie.

The Columbus (Ohio) *State Journal* says that thus far the subscriptions to this road by Sandusky and Wheeling, and nineteen intermediate towns and villages in Ohio, amount to $1,300,000. The estimated cost of the road, at $10,000 per mile, is $1,570,000. This leaves $270,000 to be raised, and it is believed that this amount can be obtained, in a short time, at points on the line where subscriptions have not yet been made.

Southern Ohio Railroads.

The people of Morgan County, Ohio, voted, August 14, to appropriate 2½ per cent. of the taxable property of the county, or about $225,000, toward building three railroads through the county, as follows: The Muskingum Valley road, from Zanesville to Marietta; the McConnelsville & Ferrara road, from McConnelsville to Ferrara, where a connection will be made with the Columbus and Ferrara road; and the Eastern Ohio road, from McConnelsville to Cumberland, connecting at the latter place with the Pittsburgh & Marietta road.

St. Louis & Keokuk.

The Louisiana, Mo., *Journal* says of this road: "The River Line road is progressing finely, the grading being nearly all finished in Pike County from above the mouth of Salt River to the Lincoln line, and a large force still at work; also in St. Charles and Lincoln counties."

St. Joseph & Denver City.

The track is laid 225 miles from Elwood, and is now within three miles of the Burlington & Missouri River Junction and 37½ miles of Kearney Station.

Kansas Central.

The road is now completed to Holton, 50 miles west of Leavenworth. An excursion train was run to Holton, August 22, and regular trains commenced running the next day. Work is to be commenced at once on the branch from Holton to Netawakee, on the Central Branch road.

Carolina Narrow Gauge.

It is reported that stock enough has been subscribed to build this road, which is to extend from Yorkville, S. C., the northern terminus of the King's Mountain Railroad, northwest to Morganton, N. C., the present western terminus of the Western North Carolina Railroad, about 75 miles through a very hilly country.

Memphis & Raleigh.

This road has been sold to Messrs. G. H. Crane & Co., of St. Louis. They assume all the liabilities of the company, about $12,000, and in return receive all the assets, about $6,000 and one-half of the paid-up stock, $25,000. They agree to complete the road inside of one year. The road, which is of 3-feet gauge, will extend from Memphis to Raleigh Springs, 8 miles, and is intended chiefly for suburban and pleasure travel.

Iowa, Minnesota & North Pacific.

Mr. J. R. Mershon, of Newton, Iowa, President of this company, reported at the first annual meeting, July 24, that 22 townships on the line of the road, from Des Moines River to the Minnesota line, had voted a tax in aid of the road amounting in the aggregate to $409,133, also swamp lands by two counties amounting to 15,290 acres, which he estimates to be worth $136,000; while two other counties (Wright and Kossuth) have *pledged* 95,000 acres of swamp lands, estimated at $568,000, and 4,000 acres of swamp lands are pledged in Humboldt County,

for which no estimate of value is given. Assuming these estimates of values of land to be correct, the subsidies voted and pledged amount to $1,133,133, which is at the rate of $6,380 per mile of road, the line being 176 miles long. A large proportion of the right of way and some depot grounds have been given.

The line of the road as located is reported by the Chief Engineer, J. A. McDowell, to be from Monroe, Iowa, on the Des Moines Valley Railroad, 128 miles northwest of Keokuk, north 17 miles to Newton (on the Rock Island road) and thence northwesterly through Nevada to Webster City, 66 miles. Thence only a reconnoisance has been made, but it is intended to continue the line of road a little west of north in the direction of Blue Earth City, Minn. The most difficult work is between Monroe and Newton, and the grading of that is now nearly completed at a cost of about $3,000 per mile. Final locations have not been made north of Newton, but for the 32 miles from Newton to Nevada the estimated cost for grading and bridging is $2,000 per mile, and for the 34 miles thence to Webster City, $1,200 per mile—the entire cost of the road-bed for the 83 miles being given at $155,800. The cross-ties for this part of the line are estimated to cost $107,000. At this rate the road can be completed for little more than $13,000 per mile.

The company expects a large coal business from Jasper County and vicinity to the treeless prairies further north, and a lumber business southward from Minnesota roads.

Atchison & Nebraska.

An officer of the company writes:

"The track of the Atchison & Nebraska Railroad is now completed to within ten miles of Lincoln, 147 miles from Atchison. It is expected that trains will be running to Lincoln during the present month. The Atchison & Nebraska route connects the railway systems of Kansas and Nebraska, and opens a new all-rail short line from Lincoln to St. Louis, the South and East, and to Chicago by all roads entering Atchison and Lincoln. The harvest is over, and one of the largest crops ever known is safely secured; with a good market the Atchison & Nebraska is assured of a good business during the fall and winter. The country tributary to the Atchison & Nebraska is extensive, fertile and well settled. The completion of the bridge over the Platte River will, no doubt, lead to a keen competition for St. Louis trade with Omaha. The road has recently received a large addition to its rolling stock, and is amply prepared for all the business that offers."

The new stations, with their distances from Atchison, are: Sterling, 111 miles; Firth, 125 miles; Hickman, 132 miles; Saltillo, 138 miles; Lincoln, 147 miles. The distance from Lincoln to St. Louis by this route will be 447 miles, against 542 miles from Lincoln to Chicago. There is no other railroad on either side of it for 30 miles or more, except near its termini, where it approaches other lines at an angle of about 45 degrees.

Macon & Western.

In the Georgia House of Representatives the present lease by which the company holds the road from the State was sustained by a vote of 106 to 44, the requirement being made, however, that a new appraisement of the property be made, and that the lessees sign their bond individually.

Atlanta & Richmond Air-Line.

The Atlanta *Constitution* says that the company has secured the right of way through the city to a junction with the Macon & Western and the Atlanta & West Point roads.

Milwaukee, Lake Shore & Western.

The Two Rivers (Wis.) *Chronicle* says that Messrs. Smith & Mann have closed an agreement on the part of the Two Rivers Manufacturing Company to grade, bridge and complete ready for the rails, the line from Manitowoc to Two Rivers, a distance of about six miles.

Stiles & Pensaukee.

The Green Bay *Advocate* says: "We hear from Mr. Anson Eldred that he has caused a survey to be made of a route for a railroad from Stiles to the mouth of the Pensaukee River; the distance being a little less than seven miles, with a descending grade of about forty feet in that distance. The route is very favorable." Mr. Eldred has important saw-mills at Stiles.

Plover & Grand Rapids.

The Plover (Wis.) *Times* says that a large force of men is about to be put on the grading between these places, and a large number of ties is being delivered along the line.

Burlington & Missouri River.

Taking advantage of the holding of the Nebraska State Fair at Lincoln next month (the 3d and 4th), this company is endeavoring to attract as many people as possible to the State, with the double object of showing their lands and the products of their and other Nebraska lands. The company has made arrangements by which tickets to Lincoln and return will be sold (by the Burlington route) from Chicago, Indianapolis, Peoria and Burlington at half rates. Intending immigrants will doubtless take advantage of this opportunity, as it will enable them to see an immense area of land in Iowa and Nebraska, now in market, including that of the Burlington & Missouri River in Iowa and Nebraska, and the Union Pacific, and the Government land in Nebraska open to pre-emption. From Chicago to Lincoln and return the fare on this occasion will be only $22.55. Mr. A. E. Touzalin, General Passenger Agent of the Burlington & Missouri road, at Burlington, Iowa, may be addressed on the subject.

Central Pacific.

The Visalia Division is now open for business as far south as Tipton, 170 miles from the junction with the main line at Lathrop, and 348 miles from San Francisco. This makes a new and comparatively quick route between San Francisco and Los Angeles, the "Telegraph Stage Line" connecting Tipton with the trains. A through rate of $128 is made for first-class passage from Omaha to Los Angeles, which is $28 more than the fare from Omaha to San Francisco. The stage company gets $17 of this.

A new route between California and Oregon has also been opened recently in connection with this company's Oregon Division, which is in operation as far north as Red Bluff, 117 miles north of the junction with the main line and 273 miles from San Francisco. The "California & Oregon" stage line runs from Red Bluff north through a mountainous country to Oakland, Oregon, the southern terminus of the Oregon & California Railroad, by which the distance to Portland is 181 miles. The stage journey requires two days and a night.

Pennsylvania.

Mr. Cassatt, the General Manager, has issued an order directing that hereafter the Brooks paradin insulator, of standard size (six inches in length), is to be used on all new telegraph lines of the company, and in repairs of the old ones. Mr. Cassatt says that he was induced to issue an order in July, 1870, directing the use of glass insulators, but that the experience with them during the two years has been very unsatisfactory, and that galvanometer measurements and records of the insulation of wires during rains, with both systems of insulation, has demonstrated the inferiority of glass; which, by the way, hardly needed demonstration to electricians, most of whom in this country and elsewhere, sometime ago discovered that glass is not the thing.

Union Ticket Office in Kansas City.

All the railroad companies which have stations in Kansas City, and whose lines extend northward or eastward, with the exception of the Kansas City, St. Joseph & Council Bluffs, have agreed to have a ticket office in common, and one agent, instead of three or four as heretofore. This office will be at No. 507 Main street, and Mr. E. S. Jewett, of the Hannibal & St. Joseph Railroad, an experienced, capable and trustworthy man, with a good knowledge of the business, will be the agent in charge.

Missouri, Kansas & Texas.

Trains of this road commenced running from Atoka, on the Middle Boggy, August 19. The time from Sherman, Texas, to St. Louis, is now less than 48 hours, by stage from Sherman to Atoka and thence by railroad. Atoka is about 53 miles southwestward from the crossing of the Canadian River, and about 65 miles from the Red River.

Alabama & Chattanooga.

That portion of the road which lies in Dade County, Georgia, has been sold at Trenton, Ga., by the sheriff, to satisfy attachments levied by holders of the floating debt. General Wofford bid in the road for the State, for $27,000 over the State's lien.

Milwaukee & St. Paul.

The bonds of the St. Paul Division have been placed on call in the New York Stock Exchange.

Detroit & Bay City.

The Detroit *Tribune*, of August 24, says that the company has now concluded all the land condemnation cases on the southern part of their line. "The company have now a gang of men upon the property just acquired from Mr. Hubbard who are preparing a road-bed for the iron and the prospects are that within a very short time trains will be run from this city to Rochester. This event it is designed to formally celebrate. The track of the Bay City road will intersect that of the Central in the vicinity of the State Retreat, curve through the property above referred to, connect with the Lake Shore & Michigan Southern and Grand Trunk roads—part of the tracks of both roads being used—and finally strike into the country a short distance beyond the Detroit & Milwaukee Junction. The passenger depot will be the same as the Central Railroad. It is possible that, in the course of time, the Grand Trunk passenger trains will enter the city by the same track and the Junction will be used for freight business exclusively."

New Steamer Lines to New York.

The first steamer of a line which is intended to ply between New York, Dublin, Belfast, Glasgow and Bordeaux, has recently arrived. It belongs to the "French and Peninsular Steam Packet Company," of London. It is expected to dispatch a vessel monthly, for the present.

A steamer from London direct has also recently arrived, which will, on its return, after touching at London, pass through the Suez Canal and on to India and China ports.

Staten Island Railroad.

At the sale under foreclosure on the 27th of August, this company's road (17 miles) and four ferry-boats were sold under the hammer for $399,000 to George Law, one of the parties bringing the suit. A fifth ferry-boat, the Westfield, was sold to another party. It is commonly reported that stockholders were also the bondholders, and that they brought about the sale in order to put the property into the hands of a new company, which will not be responsible for the damages by the Westfield explosion.

Shrewsbury River Bridge.

The bridge across the Shrewsbury River, connecting the Sandy Hook beach with the Highlands of Neversink, has been commenced. The bridge will be about 1,300 feet long, with a swing draw having openings 80 feet wide for the passage of vessels. The river is shallow in most places, with sandy bottom and a continually shifting channel.

New York & Harlem.

The contracts have been awarded for the wrought-iron highway and foot bridges to be constructed over this road above the Grand Central Depot at Forty-fifth, Forty-sixth, Forty-seventh, Forty-eighth and Forty-ninth streets, New York, to be completed within the current year. The cost is about $75,000 each.

Newark & Hudson.

This road, which is an extension of the Newark & Paterson road (leased by the Erie) from its late terminus in Newark east to a junction with the main line of the Erie Railway at the west end of the Bergen Tunnel, about five miles, is so far completed that trains began to run August 27. This completes a loop line from Paterson to the Bergen Tunnel, and this line will be hereafter called the "Newark Branch." Only seven trains each way are put on for the present, five of them running through to Paterson and the remaining two to Franklin, but as soon as the second track is finished, which will be in a few weeks, a large additional number of trains will be put on. This is the fourth railroad line running from Newark to New York, but it will, no doubt, secure a fair share of the travel between the two cities as it passes through the northern part of Newark, a section of the city which is rapidly growing and which is at a considerable distance from the depots of the older roads. The stations on the Newark Branch are: Bergen Junction, Fourth avenue, Woodside (both the latter in Newark), Belleville, North Belleville, Avondale, Franklin, Stone's Crossing, Highland, Centreville and Paterson. The section from Newark to Paterson has been in operation a little over two years.

Portage Lake & Lake Superior Ship Canal Co.

The title of this company has been changed to "Lake Superior Ship Canal, Railroad & Iron Company." It owns some iron lands on the Menomonee River, the western part of which is about 30 miles west of Escanaba, on Green Bay, extending thence northwestward about 50 miles. These iron lands are said to be among the best in the world, and the company purposes making them accessible by constructing a railroad from a point on the new extension of the Chicago & Northwestern about 25 miles below Escanaba to and through them. For the following account of the condition of the company and of its canal, we are indebted to Mr. Isaac Otis, the General Superintendent:

Already we are running tugs through the canal, and expect to let large boats through in from four to six weeks.

The canal connects the head of Portage Lake with Lake Superior; the outlet on Keenenaw Bay has been dredged so that the largest boats come into the lake (Portage) to transact their business with the towns of Houghton and Hancock, the headquarters for supplying the copper mines; and when our canal, 2¼ miles long, is completed, the boats will go through into Lake Superior, saving the long distance around Keenenaw Point, 140 miles.

At the mouth of our canal on Lake Superior we are building two long piers, having a width of water between of 200 feet, and when completed it will be one of the best harbors on the lake, with 20 feet or more at end of piers, 14½ feet inside, and capable of being entered in any state of wind. Already our piers (though uncompleted) protect our dredges, tugs and scows from the heaviest storms.

Our company has for some time past been laboring under the pressure of financial difficulties; but not long since, through an amicable arrangement of the bondholders, Mr. Isaac H. Knox, of No. 90 Broadway, was appointed receiver, with power to raise money, pay off the debts and finish the canal.

The money has been raised and the work is now being pressed under a cash basis.

The company have a land grant of 400,000 acres, embracing pine, iron and copper lands.

Mr. S. L. Smith, an active director in the Houghton & Ontonagon Railroad has been appointed receiver's agent, and your humble servant continues in the position of General Superintendent.

Denver & Rio Grande.

The grading of the Canon Branch is progressing rapidly, eight contractors being at work at different points. On the Arkansas, above Pueblo, there is considerable rock work, and at Beaver Creek a heavy rock cutting is being excavated by Orman & Co., the contractors at that point. Piles are being driven at the river crossings and track-laying will begin soon.

Colorado Central.

Work on the Western Division is being rapidly pushed. Track-laying has progressed slowly. A narrow-gauge locomotive was received at Golden, August 20. It is expected that the track will be completed to the foot of Big Hill by September 1. The track-layers reached the bridge near Guy Gulch, August 19.

Kansas Pacific.

Mr. Beverly R. Keim, General Passenger Agent, has issued a circular to the people along the line of the road, asking for choice specimens of corn, grain, fruit, vegetables or any products of the soil deemed worthy of exhibition. The specimens are to be delivered to any agent of the company on or about September 15. Mr. Keim's intention is to make an exhibition of these products of the soil at the fair of the American Institute to be held in New York in September and October. All specimens are to be carefully labeled with name of locality where raised, yield per acre, and other particulars.

Lake Shore & Tuscarawas Valley.

The Cadiz (Ohio) *Republican* reports that Mr. Streator, President of this company, has purchased the Eastern Ohio Railroad. This latter road is intended to run from McConnellsville to Dennison, about 70 miles, the general direction from Dennison being southwesterly.

Baltimore & Drum Point.

That portion of the line south of the Annapolis road has been located and grading is to be commenced at once.

Milford & Woonsocket.

The town of Milford, Mass., voted, August 26, to extend aid to the amount of $50,000 to the extension of the road to Franklin.

Boston & Maine.

A double track is to be laid between Biddeford and Saco, on the Maine Extension. Messrs. J. P. Yorston & Co., who took the contract for the construction of the road in Boston, have also the contract to build the road to Saco.

Chicago & Canada Southern.

This company is offering its 7 per cent., gold, first-mortgage bonds, principal payable in 1902, to the amount of $5,000,000, at 90. In advertising the statement is made that 25 miles of the line is completed, and 75 miles more so far advanced as to be finished this year, and that the remainder will be completed in 1873; that steel rails and ties for one-half of the line are purchased, and that the proceeds of this loan will be sufficient to complete the road.

New Route from New York to Boston.

Arrangements have been made for the opening of a new route—or rather the revival of an old one—between New York and Boston, which has the merit of variety to say the least. The passenger will first take the ferry to Hunter's Point, L. I., then the Long Island Railroad to Greenport, opposite the mouth of the Connecticut, then a steamer to New London, and there the car which will land him in Boston. The distance will be a little more than 250 miles.

THE SCRAP HEAP.

Severe Test of the Strength of Rails.

The Cedar Rapids (Iowa) *Republican* gives the following account of a singular accident which occurred recently on the Iowa Division of the Chicago & Northwestern Railway, ten miles west of De Witt.

"A heavy thunder shower had washed away a portion of the embankment over a small culvert, the latter not being able to carry off the water fast enough, so fierce was the storm and so deep the ravine. The dirt was washed away for a distance of twelve feet in length and fifteen feet deep, leaving the rails intact over the chasm, as they were joined by the patent "fish-plate joint." The express thundered along at the rate of twenty-five miles an hour, passed on the suspended rails, which bent underneath the heavy weight, but did not give way. Such was the velocity of the train and the tenacity of the rail-joints and car-couplings that every car of the long train actually passed over the chasm, although there was no support under the twelve feet of rails. The trucks of four cars were forced from under them, however, and left side by side over the chasm, and just as the rear car got safely over the rails gave way and precipitated the trucks into the ravine."

A Leaky Depot.

The Webster (Mass.) *Times* says that the railroad depot in that town is in such a dilapidated condition that in rainy weather passengers are obliged to keep their umbrellas up inside as well as outside of the building.

Heavy Contractors.

The St. Paul *Pioneer* says that Col. A. De Graff and the firm of De Graff & Co., of St. Paul, Minn., have had contracts for the construction of 604 miles of railroad begun and to be completed during the year 1872.

A Runaway Locomotive.

The Frankfort (Ky.) *Yeoman* says:

"On Thursday, as a locomotive without any cars was coming backwards down the grade on the Frankfort & Lexington Railroad, the cylinder heads were blown out at the point where the Versailles pike crosses the railroad, about four miles from town. The steam all escaping, and there being no brakes, the engineer lost all his control of his steed, and it came tearing down the sixty-foot grade at a break-neck speed, some saying it went at the rate of fifty miles per hour. It weathered all the danger safely, however, including the sharp curve above town, and the tunnel, and came thundering through the streets as never a locomotive passed through before. Striking an ascending grade as it neared the bridge, it slackened its pace and came to a stand-still just before it got across the river. Four or five hands and three or four boys were on board, and were congratulated on their miraculous escape by the large crowd which were attracted to the spot. Eddie Grant, a venturous twelve-year-old, was on the cow-catcher, and gives a lively account of it. He places the rate at three miles per minute. It doubtless seemed that to all of them."

A Heavy Train.

The new engine, "Asa Packer," built at the South Easton shops, by Mr. John J. Kinzey, Master Mechanic, recently took 95 loaded coal cars from South Easton to Phillipsburg, and took 113 empty cars thence up the road. The engine weighs 35 tons.

Military Railroad Men

The French government proposes to exercise its military in cutting and repairing lines of railroad, which it is expected will hereafter be a regular part of the training of its army.